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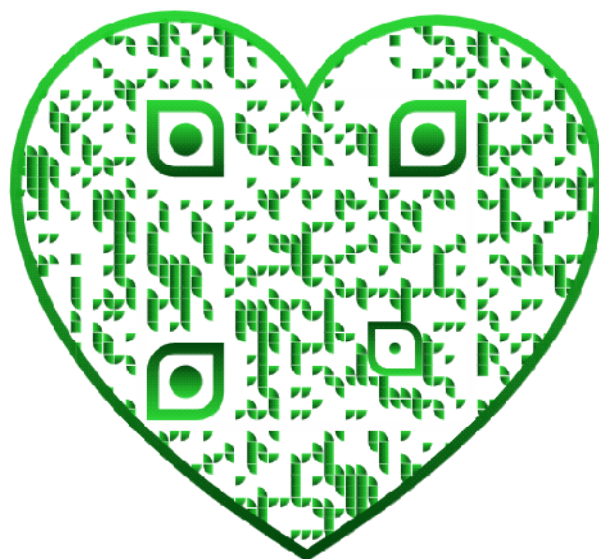
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Contents

January 2025



32



106

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See page 139

14



50



114



NEWS AND COMMENT

4 FROM THE EDITOR 6 NEWS

- Mars prepared for final flight
- Another P-51 for Biggin Hill
- Typhoon rear fuselage completed ...and the month's other top aircraft preservation news

14 WORKSHOP

The B-17 that's being restored in an Illinois barn

20 HANGAR TALK

Steve Slater's comment on the vintage aeroplane scene

22 FLIGHT LINE

Reflections on aviation history with Denis J. Calvert

24 FROM THE COCKPIT

Join Richard Crockett on his journey as a Shuttleworth pilot

REGULARS

26 SKYWRITERS

29 Q&A

Your questions asked and answered

122 PERSONAL ALBUM

The legendary film pilot Paul Mantz and his aircraft collection

140 REVIEWS: CHRISTMAS SPECIAL

Need some last-minute festive present ideas? Check out our bumper selection of books and gifts

146 NEXT MONTH

FEATURES

32 SLINGSBY SE5a

It's a star of several films — and now, thanks to the son of one of its former movie pilots, it's back flying in the UK

40 LONG AERIAL MINE

The secret World War Two weapon that scored some unlikely aerial kills

50 SPANISH CIVIL WAR FALCON

Trying to unravel the history of an unusual combat veteran from the Miles stable

TSR2 SPECIAL



Sixty years on from its cancellation, some fresh perspectives on the infamous strike jet

60 THE ORIGINAL REQUIREMENT

Britain's aviation industry came up with some unusual designs for a new strike aircraft

68 THE MOMENT OF TRUTH

Reconstructing the Cabinet meeting at which the TSR2's fate was decided

74 THE CANCELLATION

Some people in high places felt TSR2's demise was inevitable. But were they right to be pessimistic?

86 THE FATES

Two TSR2s ended up in preservation — and a third, the most important, might have joined them

90 WATT BROTHERS

Two Canadian bush pilot siblings who turned their hand to wartime ferrying

96 RAF PR IN 1944

Once D-Day was out of the way, there was no let-up for the RAF's photo-reconnaissance squadrons

106 A-7s IN EUROPE

The US Air National Guard's A-7 Corsair II squadrons practised regularly in their designated theatre of war

114 AEROPLANE MEETS... RUPERT CLARK

The ex-Tornado GR1 pilot and Gulf War PoW who loves flying his Tiger Moth and Chrislea Super Ace

125 DATABASE: CAC WIRRAWAY

An unassuming aircraft the multi-purpose Wirraway may have been, but it holds a special place in Australian aviation history. James Kightly and type expert Derek Buckmaster explain why



14
IN-DEPTH
PAGES

COVER IMAGE: TSR2 XR222, preserved by IWM Duxford, outside at the Cambridgeshire airfield in the autumn of 2005. DARREN HARBAR

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From the Editor

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Coming across the minutes of the Cabinet meeting at which the decision was taken to cancel the TSR2 project was an education. I'm by absolutely no means the first person to have read them — they're available online, and have been tapped into for many accounts over the years since their release — but to see the original transcript covering such a momentous event laid out some of the background

in a more immediate way. That's why I decided to reconstruct the discussion, turning those slightly

abbreviated notes by the Cabinet Secretary into something closer to how the deliberations presumably played out in April 1965.

The TSR2 affair is still worth reconsidering after all these years — and so are all the underlying positions. Even now, there's space for new perspectives aplenty. The political arguments have been endlessly relitigated, very often from the point of view that Labour didn't care about defence or the aviation industry, that Prime Minister Harold Wilson was a Communist plant, or any

number of similarly specious ideas. Some of that debate hasn't been helped by certain prominent accounts failing to consider the political and economic realities. What the RAF wanted, or needed, often ends up being put to one side. So too are the developing personal antagonisms within the Wilson government that, by 1968, contributed to the TSR2's intended replacement, the General Dynamics F-111K, being cancelled too.

We'll cover that another time. But, for now, we hope our TSR2 special section — coming up to 60 years since

it was killed off — provides some stimulating new reading.

That's our desire with every edition of *Aeroplane*, and will continue to be so as we head into 2025. To make sure you don't miss an issue — and to take advantage of the very best offers — go to page 23 and find out how you can subscribe. There's a great deal to look forward to! In the meantime, all of us on the magazine wish you a very merry Christmas and a happy new year.

Ben Dunnell

“What the RAF wanted, or needed, often ends up being put to one side in the TSR2 debate”

CONTRIBUTORS THIS MONTH

MATTHEW BODDINGTON



A previous feature in this magazine about going with his late father Charles to Ireland for the filming of *Darling Lili* led directly to Matthew tracking down two of the Slingsby-built SE5a replicas that took part, and buying one of

them. It's now flying again in Matthew's ownership, and in this issue he tells this very historic machine's story. It's a particularly special one for him, as his father flew it in multiple movies.

DEREK BUCKMASTER

As a mechanical engineer with a background in lightweight materials and composites, Derek is fascinated with the development of the aviation industry in Australia. He has researched and published numerous articles about the CAC Wirraway as well as a book on the Wirraway's crop-dusting descendent, the CAC Ceres. He was a team member for the restoration of A20-10 at the Moorabbin Air Museum in 2014. As the vice-president of the Aviation Historical Society of Australia he is passionate about preserving and recording Australia's local aviation heritage.



JAMES KIGHTLY



The CAC Wirraway is in James's family heritage, as his grandmother, Lucy Whellams, was one of the first women to work at CAC in 1936. James inherited Lucy's staff badges, as well as a rare 'CAC Executive' badge she was gifted on

leaving in 1941. He's been lucky enough to fly in the type as a passenger, and, at the Moorabbin Air Museum's Open Cockpit Weekends along with co-author Derek Buckmaster, has helped hundreds of visitors to sit in the oldest surviving Wirraway, A20-10, and handle the controls.

CLIVE RICHARDS

Clive joined the RAF Museum in 1993. After three years as a curator in the museum's archive and library he moved to the Ministry of Defence Air Historical Branch (RAF), where he worked as a researcher until relocating to Cornwall in 2008. Now based in the West Midlands, Clive continues to research and write aviation history and has contributed papers and articles on a variety of subjects to several conferences and publications. In December 2017 he was awarded an MA in air power history by the University of Birmingham.



AEROPLANE
ESTABLISHED 1911

Aeroplane traces its lineage back to the weekly *The Aeroplane*, founded by C. G. Grey in 1911 and published until 1968. It was relaunched as a monthly in 1973 by Richard T. Riding, editor for 25 years until 1998.





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Final Mars flights imminent

The last airworthy Second World War-era pure flying boat was undergoing taxiing trials on Sproat Lake, British Columbia during November prior to making its final flights before the end of the year. Martin JRM-3 Mars BuNo 76820/C-FLYK *Philippine Mars* has been donated to the Pima Air and Space Museum in Arizona by fire-bombing outfit Coulson Aviation, and will make its final landing on Roosevelt Lake in Arizona. From there it will be trucked 150-odd miles south, mainly along Arizona State Highway 77, to its final resting place at the museum.

The former US Navy leviathan — it has a wingspan of 200ft — entered the water for the first time in 10 years at Port Alberni on 4 November, the red-and-white livery it wore while being operated by Coulson having been replaced some time ago with its original, overall-blue navy scheme.

Only seven Mars were built, the prototype flying for the first time on 3 July 1942 from Middle River, Maryland. Delivered to



Possibly the most majestic sight in the entire world of aviation — but not for much longer — as *Philippine Mars* gets up on the step at Sproat Lake on 5 November. ROLAND SMITH

the US Navy on 26 June 1946, *Philippine Mars* was one of five examples operated by transport squadron VR-2 from NAS Alameda, California. On 5 April 1950, BuNo 76822 *Marshall Mars* was consumed after suffering an engine fire off Oahu, Hawaii and sank, but the remaining four aircraft flew unprecedentedly

heavy loads on the route from San Francisco to Honolulu, BuNo 76824 *Caroline Mars* achieving a then-world record passenger load of 269 people on the service on 4 March 1949 before the navy retired the type during 1956.

Four examples were subsequently converted into firefighting configuration,

Philippine Mars and its stablemate *Hawaii Mars* joining the Coulson inventory in 2007. BuNo 76823 *Hawaii Mars* flew with great fanfare to a new home at the British Columbia Aviation Museum on 11 August 2024 following donation by Coulson — see the news pages of our October 2024 issue.

Spectacular vortices being generated by the Mars' huge propellers, turned by four 2,500hp Wright R-3350 Duplex-Cyclone 18-cylinder engines, during taxi trials. DEREK HEYES



Frédéric Akary in P-51D
44-12473 *Moonbeam
McSwine* during the 2014 La
Ferté-Alais show. BEN DUNNELL



Moonbeam Mustang for Biggin

North American P-51D Mustang 44-12473/N51VL *Moonbeam McSwine* has been acquired from Moonbeam Historic Military Aircraft of Waukegan, Illinois by Biggin Hill-based Warbird Experiences, and was registered G-MCSW on 20 November. The October 1944, Inglewood, California-built fighter was operated from 2013-17

by French warbird pilot Frédéric Akary, who gave spellbinding aerobatic displays in it at several European events.

The original *Moonbeam McSwine* was flown by Bodney-based 487th Fighter Squadron, 352nd Fighter Group ace Capt William Whisner, who was credited with 16.4 aerial victories during the Second World War.



F4U-1 Corsair BuNo 02465, here undergoing a trial 'suspension' in late October, has been finished in its original 1943 non-specular medium blue grey and light grey colour scheme. NMNA

'BIRDCAGE' CORSAIR GOES ON SHOW

Following a 14-year restoration, Vought F4U-1 Corsair BuNo 02465 was rolled into the National Naval Aviation Museum's West Wing at Pensacola, Florida on 12 October, prior to being suspended from the ceiling as part of the museum's extensive World War Two display.

The rare 'birdcage' Corsair — said to be the 312th production example of the type — was discovered by A&T Recovery in 1995 at a depth of 220ft in Lake Michigan, into which it had crashed on 12 June 1943 after a misjudged landing during carrier training on the USS *Wolverine*. Ensign Carl Harold Johnson went off the side of the converted paddlewheel steamship, surviving the mishap. BuNo 02465 was recovered on 2 November 2010, the salvage being sponsored by warbird collector/restorer/pilot Chuck Greenhill.

With the F4U-1 on display, the National Naval Aviation Museum has been able to loan F4U-4 BuNo 97349 to the USS *Midway* Museum in San Diego, California. It arrived aboard the former aircraft carrier on 16 November.

Rear fuselage milestone for UK Typhoon project

At Sandown, Isle of Wight on 30 October, the rear fuselage of the Hawker Typhoon Preservation Group's Typhoon Ib RB396/G-TIFY was completed in the premises of Airframe Assemblies, which has conducted the rebuild of this section. As part of the event, former RAF engine fitter Mervyn 'Gerry' Blow ceremonially installed one of the final rivets to go in, the recent centenarian having worked on Typhoons during wartime with No 137 Squadron, and then Tempests on No 274 Squadron.

This is the first fuselage section of the type to be made flyable since the war years. It was transported to Airframe Assemblies in May 2019, work resuming just before Christmas last year following a pause due



The completed rear fuselage of Typhoon RB396, joined by the project's cockpit and tail sections, in the Airframe Assemblies workshop at the end of October. STEVE COMBER/COAP

to post-COVID funding issues. "We wanted to use as much original material from RB396 as

possible", says project director Sam Worthington-Leese. "The original skins, obviously,

couldn't be used but the frames and the stringers could. We're waiting for the final figure, but approximately 80 per cent of the frames and stringers are original material. The stringers could not be used in their single sections — there were areas within that were not good enough to use — so there have been some elements that have been created from new."

Once quotes for the job have been received, the HTPG will take a decision on whether the cockpit or tail of RB396 will be tackled as the next stage of the project. Now that it's ready, the rear fuselage will be stored while subsequent sections go through the restoration process.

For a more detailed report, buy our *Aeroplane Yearbook 2024-25*, out now — see page 85. **Ben Dunnell**

Kiwi Mustang arrives in Oz

Forty years after it became the first aircraft acquired by Sir Tim Wallis for his nascent Alpine Fighter Collection at Wanaka, North American P-51D Mustang 44-74829/ZK-TAF arrived at Scone, New South Wales on 5 November after being flown across the Tasman Sea by Steve Death. Operated by Warbird Adventure Rides from Drury, 23 miles south-east of Auckland between 2017 and 2023, the Mustang — painted as Royal New Zealand Air Force aircraft NZ2415 — has been purchased by Ross Pay of Pay's Aviation at Scone.

Ross says, "We're delighted to add this iconic aircraft to our showcase collection on display at Hunter Fighter Collection, Scone. It's not just a remarkable addition to our displays; it also offers aviation enthusiasts a rare chance to take adventure flights, enhancing the overall experience for our visitors."

Ross is chairman of the Hunter Fighter Collection, and it will join two other Mustangs on display there. One of those aircraft is P-51D 44-73415, which was gifted to the collection by the RAF Museum during the autumn of 2022 as part of the RAFM's



P-51D 44-74829/ZK-TAF, wearing the spurious RNZAF serial NZ2415, at the Warbirds over Wanaka Airshow in late March 2024. DAVE HOMEWOOD

disposals and loans programme, arriving at Scone on 6 April 2023. The other is Ross Pay's Commonwealth-built Mustang, A68-107/VH-AUB, which is under restoration to fly.

Back in 2022, Maggie Appleton, the chief executive officer at the RAF Museum said in relation to the P-51's disposal, "Museum artefacts are more than just objects; they are a doorway to stories, memories and experiences that endure across generations. We are incredibly proud to be transferring the Mustang and a de Havilland Vampire to the

Hunter Fighter Collection so that others across the world can learn from and be inspired by them."

It is known museums in the UK put in bids to the RAF Museum for 44-73415, a former US Army Air Forces/Royal Canadian Air Force fighter that was obtained by the RAFM in the late 1980s in a swap deal that saw Supermarine Spitfire XVI SL574, the former Bentley Priory gate guard, going to the USA. The Spitfire is now on show at the San Diego Air and Space Museum.

St Athan museum adds Varsity

Vickers Varsity T1 WJ945 arrived at the South Wales Aviation Museum at St Athan on 14 November from Newquay Airport, where it had been on show at the Cornwall Aviation Heritage Centre until that attraction closed in October 2022.

There had been fears that the former Central Flying School crew trainer would be scrapped until Gary Spoors and his team from St Athan stepped in to save the 1952, Hurn-built machine, which was operated by the Duxford Aviation Society as G-BEDV from the mid-1970s until the mid-1980s. After being grounded it was taken on by the Imperial War Museum, only to be disposed of during 2012, after which it was roaded to Newquay.

SWAM's Gary Spoors says, "During recent storms in the south-west the fuselage of WJ945 rolled off its cradle and it ended up on its side, but it only suffered a couple of creases and a broken window which the team here will fix. The inner wings are already being worked on in our restoration hangar. We will probably replace the overall silver finish — our Meteor T7, Hunter T7 and Vampire T11 are all silver — and repaint it in the red-and-grey Central Flying School livery."

Living up to its 'Flying Pig' appellation, the characterful fuselage of Varsity T1 WJ945 is unloaded at St Athan on 14 November. VIA GARY SPOORS



Swift WK277 on display at Newark, as it has been for 55 years. ALAN WILSON

SWIFT TO LEAVE NEWARK

A statement from the Newark Air Museum on 1 November announced that Supermarine Swift FR5 WK277, which has been displayed there since 1969, is set to leave the Winthorpe, Nottinghamshire site. The privately owned aircraft had been on long-term loan to the museum, but was due to be moved outside due to two new acquisitions requiring indoor space. On 22

October, Newark said, a letter was received from the Swift's owner advising that it had been gifted to another museum. This was subsequently confirmed to be the South Wales Aviation Museum at St Athan. "We will shortly be entering discussions with that organisation about the Swift's move to South Wales", said the statement.

Ben Dunnell

NEW SKILLS AID BRISTOL'S BOLINGBROKE PROJECT

At Aerospace Bristol at Filton, the restoration of Bristol Bolingbroke IV RCAF 9048 has made great strides during 2024, and in October conservation volunteers Tim Nutt, Brian Metters, Keith Griffiths and Brian Serjent spent time at a workshop in Maidenhead, Berkshire where they received training on covering the rudder. With this new skill, the team is now equipped to cover the flying controls of the Bolingbroke, further advancing the restoration efforts.

Paul Jones, head of facilities, says, "The volunteers' passion for preserving our aerospace heritage and their commitment to each stage of the restoration process have driven the project forward in remarkable ways. From mastering new skills

to crafting components from scratch, we owe our volunteers a huge thank-you for their extraordinary contributions."

Back in the summer, the team successfully attached the fin. This component required extensive effort, with conservation volunteer Tim Nutt crafting the rudder support structure entirely from scratch. Following the attachment of the tailplane, the previously missing stern post — also made from scratch by Tim — was bolted to the tail cone. Once secured, the fin and rudder, both supported by the stern post, will be added consecutively, marking another key milestone in the restoration process. In addition, work on the Bolingbroke cockpit is under way. The next stages will involve the creation of new propellers.



Fabrication work under way on the fin — attached during the summer just gone — of Aerospace Bristol's Fairchild-built Bolingbroke IV RCAF 9048 in the workshops at Filton. AEROSPACE BRISTOL

NEWS IN BRIEF



EPTON AWARDED STINTON TROPHY

Historic Aircraft Association chairman Wally Epton was presented with the HAA's Darroll Stinton Memorial Trophy by Sir Gerald Howarth at the HAA's 2024 Symposium at the RAF Museum London on 16 November. The award is in recognition of an individual who has made a personal contribution of major significance to the benefit of historic aviation in the UK.

NEW SHOW FOR MANSTON

On 13 November it was announced that Manston, Kent will host an International Air Show on 16-17 August 2025, the first event to be held at the historic airport for 12 years.

R4D EUROPE-BOUND IN 2025?

After engine trouble put paid to its planned involvement in the D-Day Squadron's European tour this past summer, the Commemorative Air Force's Douglas R4D-6S N151ZE *Ready 4 Duty* — operated by the CAF Dallas/Fort Worth Wing — is being lined up for a VE-Day 80th anniversary visit in 2025, dubbed the Navy to Victory Tour. BEN DUNNELL

'JAG' AND LYNX ADDITIONS TO DUMFRIES AND GALLOWAY

SEPECAT Jaguar GR1 XZ390 was moved from RAF Cosford to the Dumfries and Galloway Aviation Museum on 22 November, just three days after Westland Lynx AH7 XZ222 arrived from the School of Army Aeronautical Engineering at Lyneham, Wiltshire.



NZ Spitfire arrives at Sywell



Safely tucked up in the Air Leasing hangar at Sywell on 13 November, Spitfire IXT MH367 will join the Ultimate Warbird Flights fleet in 2025. DARREN HARBAR

Supermarine Spitfire IXT MH367 arrived at Sywell, Northamptonshire from New Zealand on 13 November. The two-seater was unloaded into the Air Leasing hangar where it joins the Ultimate Warbird Flights fleet, also including Spitfire IXT ML407 and CAC CA-18 Mustang Mk21 G-JERK *Jersey Jerk*. It will add to the company's capacity to run Spitfire flights, although ML407 will remain the primary machine for those operations.

MH367 was built in 1943 as a single-seat fighter and served initially with No 65 Squadron and then No 229 Squadron, before ending up with No 312 (Czechoslovak) Squadron. Scrapped in 1948 following a serious landing accident, the remains were recovered by Tim Moore from the Flowers scrapyard near Chippenham. A restoration was started by Dick Melton for Charles Church, using

components from various other Spitfires, and it was converted into two-seat configuration before being exported to the USA with the 'Grace-style' canopy arrangement. The completed aircraft was flying again by 2006, painted in the markings of US Army Air Forces pilot Maj Robert Levine while based in Tunisia. By 2008 it had been sold to New Zealand and registered ZK-WDQ, the North African campaign colours of New Zealand's highest-scoring ace, Sqn Ldr Colin Gray, subsequently being applied.

Since its arrival in the UK, the aircraft has been stripped of paint and various parts removed for overhaul and reassembly, before it emerges as part of the Ultimate Warbirds fleet in 2025. MH367 will provide an excellent opportunity for customers to fly alongside friends and family as a Spitfire pair from Sywell. **Darren Harbar**

“MH367 will provide an excellent opportunity to fly in a Spitfire pair from Sywell”

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Tornado GR1 arrives at award-winning Solway museum

Gulf War-veteran Panavia Tornado GR1 ZA475 arrived at the Carlisle Lake District Airport home of the Solway Aviation Museum on 5 November after a 30-mile road trip along the A69 from RAF Spadeadam. This aircraft holds special significance for Solway as the museum's media manager, Mal Craghill, once served as a navigator on ZA475. The move was co-ordinated by RAF Heritage, with museum volunteers working alongside the Ministry of Defence's Joint Aircraft Recovery and Transportation Squadron (JARTS) and Cockermouth-based

Lawsons Haulage to disassemble the aircraft and then unload it at its new home.

Wg Cdr Matt Lawrence, station commander at Spadeadam — the electronic warfare tactics facility is the largest of all RAF stations, covering 9,600 acres — transferred the aircraft's history to Dougie Kerr, chairman of the Solway Aviation Museum, as ZA475 was prepared for its final journey. Lawrence remarked, "It's sad to see it go, but I'm very glad it will be on display for the public to see at Solway Aviation Museum, which is a centre of excellence for aircraft restoration."

Dougie Kerr, museum chairman, said, "We owe a big thank-you to RAF Heritage. It's taken a long time to have an aircraft donated to us but after all this time, it's here... As well as being a Tornado, which is good for the collection, it's for the people of Cumbria as well. The Tornado has been part of the low-flying scene through the Lake District through the years; that's why we've got it."

ZA475 entered service with the RAF in 1984, and spent its operational career with Nos 12, 16 and 27 Squadrons. During Operation 'Granby' the machine was deployed to Muharraq,

Bahrain. Retired from service at Lossiemouth in September 2001, it soon became the station's gate guardian, where it remained until the summer of 2023 when it was replaced by Tornado GR4 ZA463 and moved to Spadeadam.

The Tornado's arrival follows on from the museum being given the Aviation Heritage UK Robert Pleming Memorial Award at a ceremony held in the Yorkshire Air Museum at Elvington on 26 October for its endeavours in rescuing the world's only surviving Blackburn Beverley C1, XB259, from imminent scrapping at Fort Paull. The Beverley is being reassembled at Carlisle.

RESCUE PLAN UNDER WAY AT OBSCURE JETS COLLECTION

SPECIAL REPORT



Pictured at Bakers Hill Farm near Pershore, Meteor T7 WH166 is probably the pick of the airframes in the Birlingham Jet Aircraft Collection. BARRY LOVE

Hawker Hunter F6 XF526 left the Birlingham Jet Aircraft Collection near Pershore, Worcestershire, on 16 November, heading for a new home with the Aircraft Restoration Group at Fishburn, County Durham. Efforts are under way to save several other historic jets that have been housed at the collection's home at the Bakers Hill Farm site for more than 20 years.

Barry Love, project officer on the committee of Aviation Heritage UK, says, "It all began about two months ago, when I donned my Aviation Heritage UK 'hat' and visited Bakers Hill Farm to talk to Graham Revill, the owner of five classic fighter/trainer jets: Gloster Meteor T7 WH166, Hawker Sea Hawk FB5 WF299, Hunting Jet Provost T3 XN632, de Havilland Vampire T11 XE979 and the Hawker Hunter, all of which are now sadly in a very poor state after decades out in the open, largely uncared-for, due to the safety restrictions of access as it is a busy, live, working farm.

"Initially, I asked Mr Revill if we might negotiate access to the aircraft on behalf of the members of the Facebook group, Birlingham Classic Aircraft Preservation Group, as a number of its members had visited the collection on rarely permitted occasions in order to clean them down and cut back the advancing and entangling brambles and undergrowth.

"He said that it would still be very difficult due to the same ongoing health and safety issues of it being a live farm, etc, and before I knew it he was voluntarily discussing the possibility of moving them on to a place of safety to get them renovated for display. His son — who'll inherit the farm — doesn't want the collection at all and was intending to scrap them all after his father's eventual passing, so, 'if someone makes me an offer', Graham told me, 'then I'd be happy to let them go now'. This comment, after many attempts by visiting predecessors to pry the aircraft away for preservation, took me aback a little, but I negotiated a provisional deal with him, pending discussion and support from my colleagues on AHUK's



ABOVE: The former RAF Spadeadam gate guard Tornado GR1, ZA475, shortly after arrival at the Solway Aviation Museum on 5 November. MAL CRAGHILL
ABOVE RIGHT: Dougie Kerr (left) receives the Robert Fleming Memorial Trophy from 'Black Buck' Vulcan pilot Martin Withers. VIA ALLAN WINN
TOP RIGHT: Reassembly of Solway's star exhibit, Beverley C1 XB259, is progressing at the museum's Carlisle Airport site. MAL CRAGHILL

executive committee, and we worked from there. Mike Eastman from the Aircraft Restoration Group at Fishburn agreed to visit the farm to carry out a condition survey of the aircraft, and a figure was offered to Mr Revill in agreement with our original negotiation, so we began the planning to find a new homes for the collection.

"Mike's own team in County Durham was keen to acquire the Hunter, so that became the first of the collection to be dismantled, with great difficulty due to corrosion in the wrong places! Then another buyer stepped in to acquire the Sea Hawk, which is going to the East Midlands Aeropark at Castle Donington, Derbyshire for restoration under the ownership of David Warren.

"Initially, I had agreed with Mr Revill to find a means by setting up a Crowdfunder appeal to purchase the Jet Provost and Meteor, then hopefully place them both with the Wellesbourne Wartime Museum, who were delighted to get the chance to squeeze them into their grounds on Wellesbourne airfield. The Jet Provost would 'match' its existing 'piston' Provost T1, WV679 and the Meteor would add presence and 'menace'.

"At that point a couple of unexpected offers came in for the Meteor, one to buy it for placement at Wellesbourne, but neither offer came to fruition, so we resumed its inclusion in our Crowdfunder appeal, which is set at a £12,000 target to buy both aircraft and pay for transport, crane lifting, etc, and hopefully leave a little in the kitty for restoration work.

"This left the Vampire to find a home for, but given the severely deteriorated state of its wooden fuselage pod after all those years out in all weathers, we had planned just to dismantle it, then move it to Fishburn for long-term storage to dry it out and reassess its fate in the future, if salvageable, or possibly find another pod to build a complete airframe. Enter Paul Atkin of the Vampire Project in Bedfordshire with a reasonable offer for the aircraft, to carry out that latter option of matching the airframe parts to their newly restored pod that is missing all those airframe parts. One problem solved!

"That is pretty much the current status of this marathon movement project; however, our Crowdfunder isn't doing anywhere near as well as we'd anticipated. Sadly, very few of the original supporting members in the Facebook group have responded. So we need to spread the appeal further into a general heritage support appeal, with a few requests for possible corporate support, donations or sponsorship to help things along.



On 16 November, Hunter F6 XF526 left Bakers Hill Farm for a new home with the Aircraft Restoration Group at Fishburn, County Durham. BARRY LOVE

"It doesn't matter either if another buyer might step in with an offer for the Meteor — space is tight at the Wellesbourne Wartime Museum — and although they'll be able to squeeze it in, they'll happily let it go elsewhere and settle just for the Jet Provost.

"In short, all that matters with this clearance project is to move all five of these aircraft to safety, to prevent them from being smelted down. The Crowdfunder has now been extended to 12 January 2025, but if it hasn't reached a decent percentage of its target by then, I'll either review our options, or try to extend it further to gain time for more pledges of donations."

See www.crowdfunder.co.uk/p/help-us-move-the-revill-jet-collection to donate.



WORKSHOP

The fuselage of B-17E Flying Fortress 41-2595 dominates the workshop in Marengo, Illinois. STEFAN SCHMOLL



ODE TO A RAT

Explore the cornfields of rural Illinois, and you'll find most of the barns full of agricultural equipment. But Mike Kellner's place in Marengo is different. Inside is a Boeing B-17E Flying Fortress, dubbed *Desert Rat*, which he hopes to fly one day **WORDS: STEFAN SCHMOLL**

Many great things begin with a small step. Mike Kellner from Illinois took just such a step 40 years ago. A forgotten Boeing B-17 was rumoured to be lying somewhere in the woods in Maine. Mike tracked down the owner, drove 1,200 miles to get there, and agreed on a price of \$7,250 for the mass of scrap metal that had once been a four-engined bomber. This pile

of apparent junk was the seed of Mike's lifelong dream of one day owning and piloting a Flying Fortress.

Built in 1941, the aircraft should have been scrapped shortly after the war. Instead it wound up in a small family-owned scrapyard in LaGrange, Maine, where it was forgotten and slowly overgrown. Sometimes it has been reported that, in the late 1960s, aviation

enthusiasts from Massachusetts looking for a North American B-25 Mitchell became aware of the B-17 wreck. Apparently the group removed its engines, propellers, undercarriage and some small parts and disappeared as quickly as they'd come. Mike now confirms he also recovered the remains of the B-25 and, when he first inspected the B-17, its landing gear, engine mounts and

cowlings were still there. Only the engines and propellers were missing. He assumes the original owner sold them himself some time in the post-war period.



So it was that Mike Kellner stepped in and salvaged what he could from the Fortress. Without the backing of a large organisation or a lot of money behind him, he and some



If you go down to the woods today... The fuselage, nose, port wing section and tail fin as found at LaGrange, Maine. BILL STANCZAK ARCHIVE



friends set about bringing it back to his home state of Illinois. Seeing photos of the rescue makes you realise what an achievement the subsequent project has already been. Both the fuselage and wings were cut multiple times before being left to nature on the farm in Maine. Another decade passed before the B-17 found its final home in Marengo, and Mike and his dedicated helpers began to rebuild it piece by piece.

The aircraft started life in 1941, when it came off Boeing's production line in Seattle as a B-17E-BO with serial 41-2595.

Delivered to the US Army Air Forces on 14 April 1942, it was allocated to the 97th Bomb Group at Sarasota Field and then MacDill Field, Florida, but it was never destined for operational duties as a bomber, being employed at various locations around the USA as a crew trainer. Then, from August 1943 to June 1944 it was rebuilt by Fairfield Air Service Command at Patterson Field, Ohio as an XC-108A freighter.

Two each of B-17Es and B-17Fs were converted into different versions of C-108, of which two were used as





The forward fuselage section was brought out of its long-time resting place and, along with all the other items, taken to Galt Airport in September 1985. BILL STANCZAK ARCHIVE

VIP transports, including the Boeing-modified XC-108 41-2593 — the first of a series of aircraft named *Bataan* for Gen Douglas MacArthur — and YC-108 42-6036. B-17F 42-30190 was intended as a fuel tanker, the XC-108B, while 41-2595 was planned as a standard cargo and troop transport without VIP equipment. The changes made to 41-2595 included sealing the bomb bay and installing a large, upward-opening cargo door on the port side of the fuselage, behind the wing. The Fortress's extensive defensive armament and heavy armour were removed.

Severe engine trouble delayed the XC-108A's operational test deployment to India, where it was intended for use over 'the Hump' to China, and it was quickly discovered that the converted bomber was not particularly suitable as a freighter. In October 1944, 41-2595 returned to the USA and was used by the 1379th Base Unit at Dow Field in Bangor, Maine, its taskings including sorties to Newfoundland and Greenland. Latterly on the strength of the 147th Base Unit, it made its last flight back to Dow Field on 26 December 1945.

After Mike Kellner bought the dismantled remains, he transported them to Galt



The fuselage of B-26B Invader 44-35696 in external storage. STEFAN SCHMOLL

WAITING IN THE WINGS

Over the past four decades, Mike has collected countless parts for possible use in his B-17 project. One day he came across Douglas B-26B Invader 44-35696/N8036E, which crashed on take-off from Kanakee, Illinois in 1993 and was subsequently written off. Mike has not yet decided whether this twin-engine attack bomber will be rebuilt or exchanged for important B-17 parts. At the moment, most of the Invader is stored disassembled behind the barn in Marengo.



Airport, Illinois, where some initial work began. Only in 1995 was it possible to construct a dedicated hangar in Marengo. Soon after the sections were moved there, the restorers discovered the name *Desert Rat* as nose art under some stripped layers of paint, as well as *Tangerine* on another part of the forward fuselage. Why the aircraft was dubbed *Desert Rat* has not been determined, since 41-2595 was never used in the desert, but it's now known by that name again.

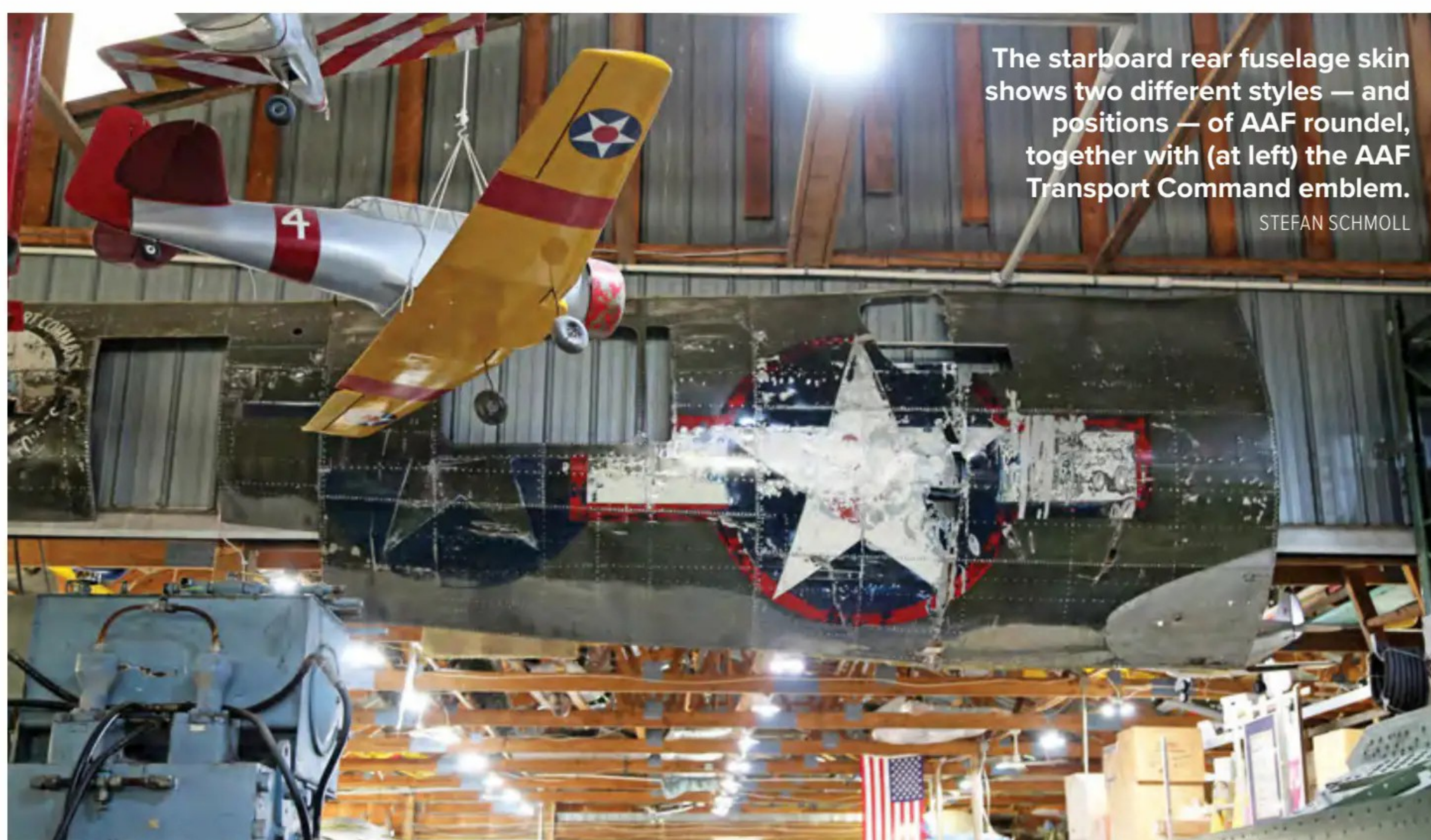


The level of quality the restorers are achieving in a barn in the middle of nowhere is simply remarkable. Taken back to B-17E configuration, the fuselage structure has almost been completed and the hydraulic and electrical systems are being reproduced. Fortunately, a lot of the aircraft's inner workings have remained intact, so there are at least still templates for those elements that need to be made afresh. Many pieces of equipment have proved repairable, and if not it has been possible to purchase suitable parts. Next to the fuselage, the instrument panel is now ready for installation in the cockpit. The original bombsight is available and will be reinstalled. The lower portion of the tail and the first two engine nacelles have not long been finished.

Recent progress has been made on improving the wing structure, as part of which a distinctive corrugated wing from a Junkers Ju 52/3m can be found in the hangar. The



Re-riveting part of the fuselage in the Marengo facility, which was put up in 1995. BILL STANCZAK ARCHIVE



The starboard rear fuselage skin shows two different styles — and positions — of AAF roundel, together with (at left) the AAF Transport Command emblem.

STEFAN SCHMOLL



The instrument panel awaits future installation. STEFAN SCHMOLL



Restoration of the wings is a significant current focus. STEFAN SCHMOLL



Sitting in front of the B-17E's fuselage here are one of the engine nacelles and, beyond that, the lower tail section complete with gun position. STEFAN SCHMOLL

question as to why is answered with a knowing smile by Bill Stanczak, one of the restorers. It is easy to forget that the prototype Boeing Model 299 completed its maiden flight in 1935, and was therefore closer in time to the Ju 52 than the likes of

Boeing's later B-29. A corrugated aluminium structure is hidden under the smooth sheet metal, significantly strengthening the B-17's wing.

Most of the original airframe skin is now used only for reference, and a large piece from

the fuselage hangs from the roof. Components from 41-2595 are stacked around the hangar, as well as countless parts of other B-17s collected from all over the world that can either be used in the restoration or exchanged with other projects. Mike

has now found four suitable Curtiss-Wright R-1820 Cyclone nine-cylinder radial engines to power *Desert Rat*, which will, of course, need to be overhauled if sufficient time and money are available.



Desert Rat team members Patrick Westerburg, Bill Stanczak, Mike Kellner and Chris Gibson. STEFAN SCHMOLL

At the same time as bringing the B-17E together, Mike has collected all the technical drawings for the earlier B-17C, of which only 38 examples were built in 1940. He has also been able to save some original parts from C-model airframes, acquired from various sources. The hope is that it will prove possible, once *Desert Rat* is done, to resurrect one of the early B-17s with the shark fin.

These are true enthusiasts putting their heart and soul into a dream. Mike Kellner hasn't set a timeframe for completing the project, nor has he even come close to counting the hours he's spent on it so far. The team does the best it can with the available finances and time. But one thing is certain: when B-17E *Desert Rat* flies one day with Mike at the controls, it will not only be the oldest airworthy Flying Fortress, but an example of what can be achieved with dedication and drive. **A**

For more information, regular updates and to support the rebuild, see the *Desert Rat* Restoration Project page on Facebook.

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STEVE SLATER

HangarTalk

A vintage light aircraft aficionado's view on historic aviation

The news broke in recent weeks that Gladman Developments has posted a new planning application to Stratford District Council regarding the development of Wellesbourne airfield. The proposal includes the removal of the existing runways, as well as the construction of a single new runway and associated taxiways, and a covered viewing area for the refurbished and enhanced airfield café. It also proposes up to 3,000 square metres of new aircraft hangarage, if tenants can afford it, as much as 1,000 square metres of new tenant modular buildings, 1.67 hectares of hardstanding for aircraft parking and 3.43 hectares of grass for the same purpose, the installation of roof-mounted photovoltaics on existing airfield buildings and of electric charging infrastructure.

So far, so good, but let's not forget that back in 2013 the same company advocated the wholesale demolition of the former airfield site to accommodate a large housing estate. Thus, not surprisingly, the new application has rung alarm bells with the local Wellesbourne Matters action group.

Many see Gladman's latest submission as unworkable. A short runway, surrounded by buildings, offers nowhere to land in the event of an engine failure and rules out most of the aircraft that currently fly from Wellesbourne. It also includes the



Vulcan XM655 is Wellesbourne's best-known resident, mingling with the local GA population. But what does the future hold for the popular Warwickshire airfield? STEVE LYNES

creation of up to 165,000 square metres of general industrial, storage or distribution and light industrial floor space and ancillary office accommodation. You can see where this is going, can't you? Perhaps an industrial park, so often a developer's

Avro Ansons there, instructing crews for Bomber Command. Subsequently the aerodrome was briefly home to No 3 Glider Training School, preparing for war in the Far East using the General Aircraft Hotspur. It was then returned to the original

“The new planning application has rung alarm bells locally”

preferred method of turning land into money?

RAF Wellesbourne Mountford was originally opened in April 1941, constructed to the typical Class A three-runway airfield design. First of all, No 22 Operational Training Unit flew Vickers Wellingtons and

owners, with two runways for light and executive aircraft and helicopters. An attractive destination allowing easy access to 'Shakespeare Country' and the Cotswolds as well as cities including Coventry and Birmingham, Wellesbourne hosts a weekly market and an annual

Wings and Wheels event where military and classic cars mingle with various historic aircraft including the in-house, taxiable Avro Vulcan B2, XM655. Prospects for both the Vulcan and the current on-site aviation museum exhibits remain unclear.

At the end of the war, Britain was left with a proliferation of aerodromes large and small. There were, in the words of former test pilot Eric 'Winkle' Brown, "as many airfields in southern England as ticks on a dog's back" — which was just as well as when he was flight-testing the early jets. Flame-outs and unscheduled dead-stick arrivals were apparently, at one stage, as frequent as powered returns to Farnborough.

Naturally, many of these sites rapidly reverted to agriculture, but we are now left with an estimated 176 airfields, a mixture of those which remained in military hands along with those used for civilian flying. But we are in the process of losing to housing the former Stirling, Lancaster and Mosquito bomber base at Bourn in Cambridgeshire, and have already lost the delightful grass airfield at Panshanger in Hertfordshire, summarily closed when the land-owners refused to renew the operator's tenancy. Is Wellesbourne scheduled to be the next? Or will people power allow this delightful — and busy — airfield to continue?

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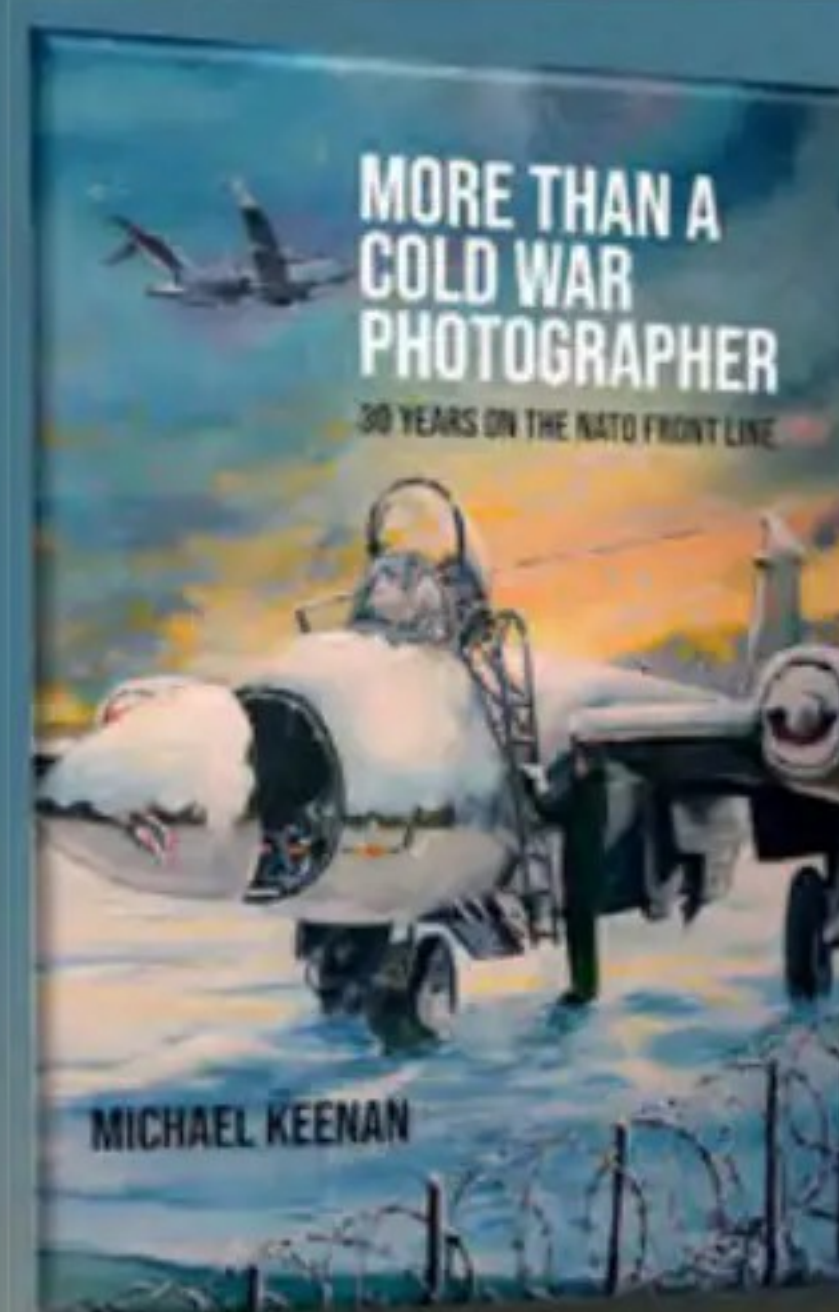
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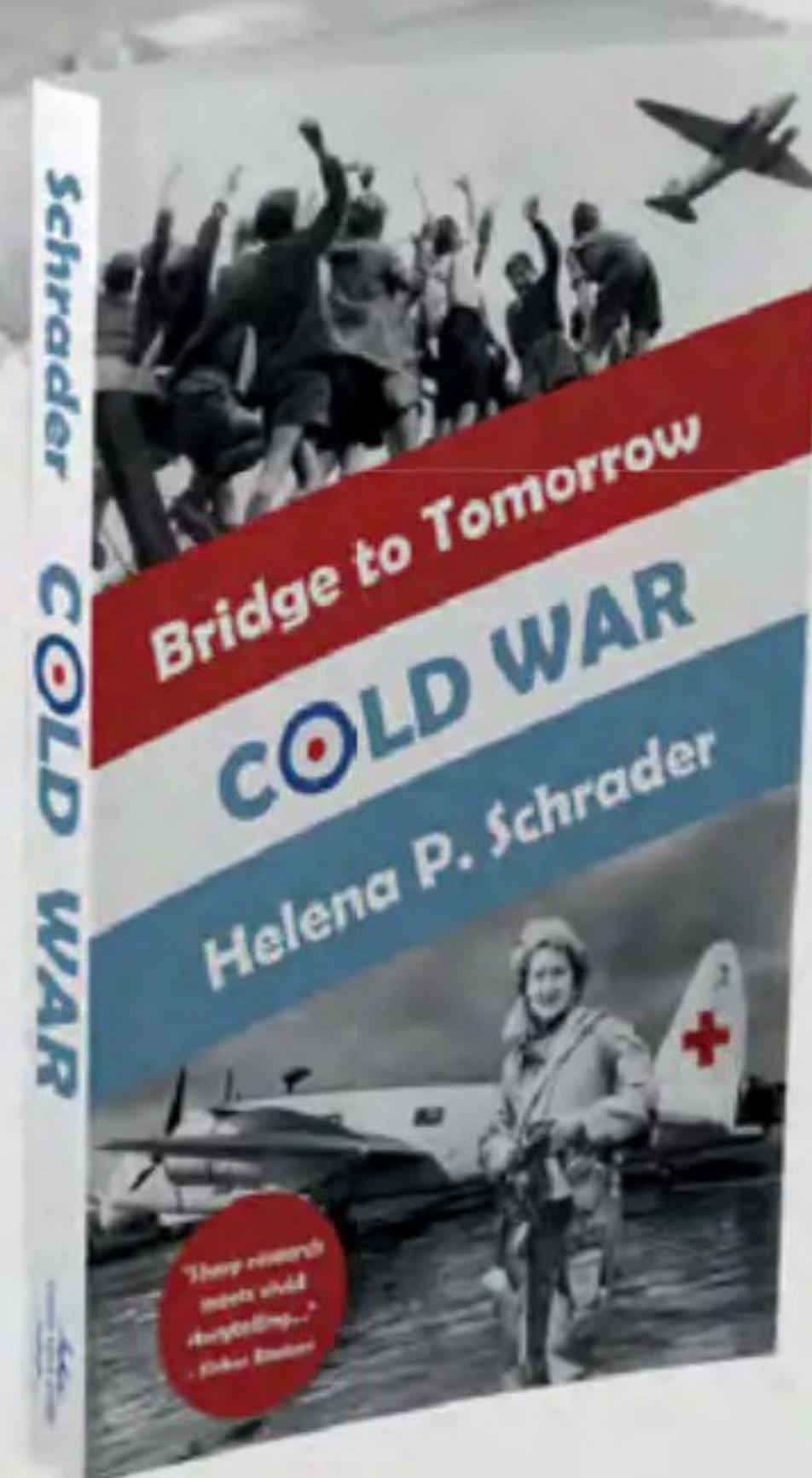
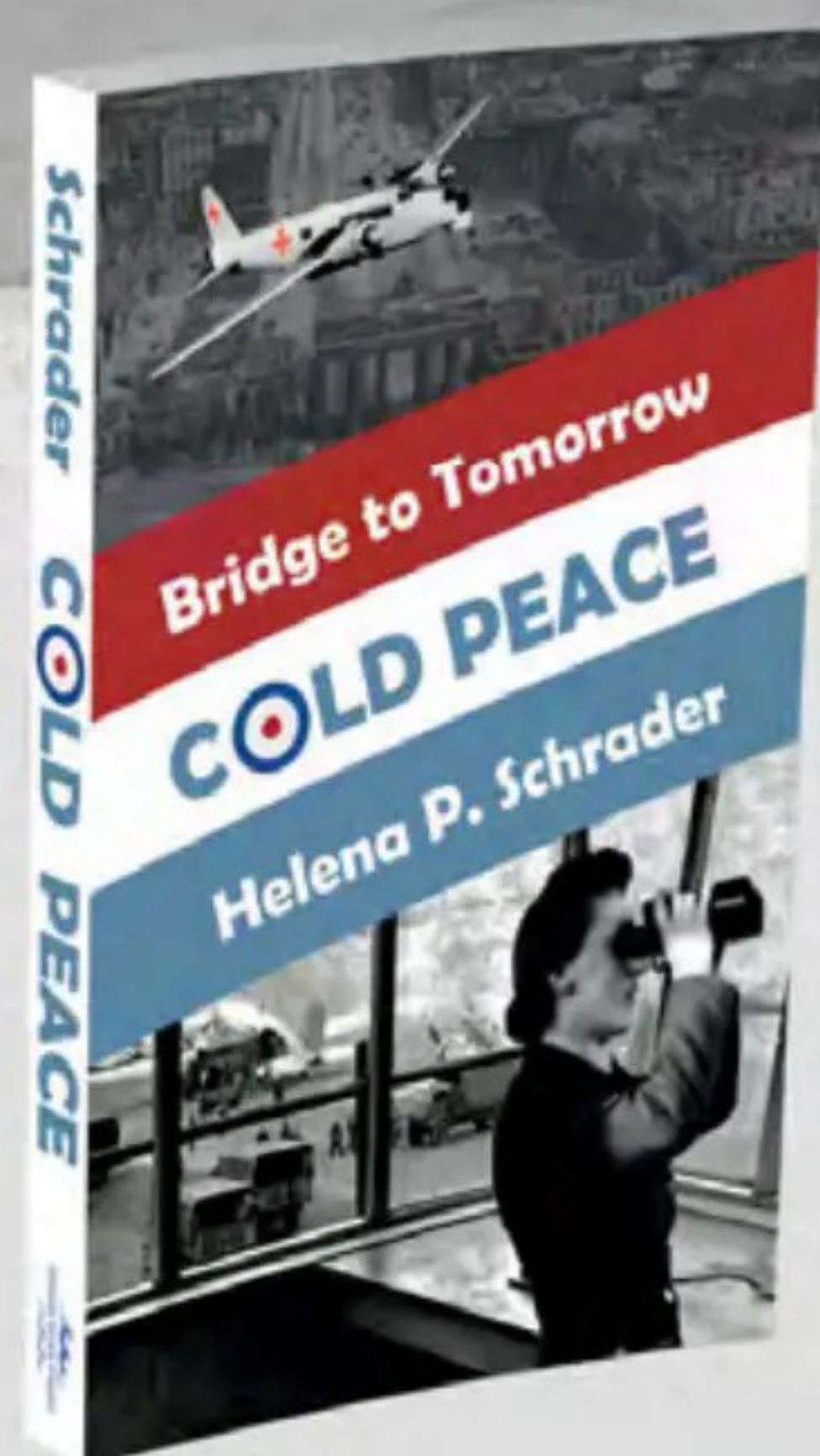
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DENIS J. CALVERT

FlightLine

Recollections and reflections — a seasoned reporter's take on aviation history

In the complex matter of designing, testing and putting into service a new aircraft type, the subject of giving it a suitable name is hardly high on the list of the manufacturer's priorities. Boeing succeeds in promoting its airliners quite successfully by using simply the company designation — 707, 737, 777 and so forth, with only the 787 additionally named as the Dreamliner. That Boeing's 727, without a name, managed to out-sell Hawker Siddeley's Trident by a factor of 15 (1,832 examples built versus 117) would seem to underline just how unimportant it is to assign an aircraft a name as well as a designation. On the other hand, Spitfire is an example of an evocative moniker that caught the public imagination and, indeed, entered the realm of folklore. It was reputedly chosen by Sir Robert McLean, Supermarine's chairman, after his daughter Annie, whom he called his "little spitfire". Had it been just the Supermarine Type 300, would Brits, 85 years on, still proudly speak of "the Type 300 and the Hurricane that won the Battle of Britain"?

Aircraft names, rather than designations, seem to matter little to those in the US armed services. The F-4 Phantom II was universally referred to simply as "the F-4". Despite the Lockheed Martin F-35 officially being the Lightning II, or just the Lightning to the RAF and Royal Navy, pilots — whether in the



US Air Force, US Navy or the UK services — generally call it by its designation alone. In fact, while the name Lightning has been used on two Lockheed fighters, it was also bestowed with a nod to the English Electric Lightning, built by a predecessor company of BAE Systems, a Level I partner in the F-35 programme.

the 'Warthog'. Douglas — or its successor companies McDonnell Douglas, then Boeing — has produced three Globemasters. The original was the C-74, a military transport that saw only limited service with the USAAF/USAF. More successful was the C-124 Globemaster II, which was produced to 448 examples

“ Giving a new aircraft a suitable name is hardly a high priority ”

There are several examples of manufacturers giving the same name to two different types some years apart, especially when having a similar role. Of course, Republic's wartime P-47 was the Thunderbolt, as is the Fairchild Republic A-10 ground attack aircraft that first flew in 1972, and is more often dubbed

for the USAF and served for 25 years from 1950. Globemaster III was assigned to the C-17, the impressive four-jet airlifter that today provides the backbone of the USAF's strategic transport fleet. To its crews, of course, it's still "the C-17".

A stranger reuse of a name is that of Raider. Northrop

produced the YC-125 Raider, a post-war, three-engined STOL transport originally intended for the civil market. Not finding any success there, it was pitched to the USAF, which purchased 23 examples. Seventy years later came the Northrop Grumman B-21 Raider, a second-generation flying wing stealth bomber and successor to the B-2 Spirit. Any connection, apart from the name, between these two disparate types is difficult to fathom.

Closer to home, three generations of RAF front-line fighters have reused the names of wartime Hawker types. The original Tornado was a Rolls-Royce Vulture-engined interceptor fighter first flown in 1940. Never produced in quantity, it laid the foundations for the family of Hawker fighters to follow. Envisaged as a successor to the company's Hurricane, the Napier Sabre-powered Typhoon of 1941 earned its spurs as a close support aircraft after D-Day. The Tempest, originally called Typhoon II, was the best of breed and served with the RAF, the Indian and Pakistani air forces. That these evocative names were picked up, dusted off and reissued to three multi-national jet fighter programmes — the Panavia Tornado, the Eurofighter Typhoon and the sixth-generation Anglo-Italian-Japanese GCAP aircraft which, in RAF service at least, will be called Tempest — seems entirely appropriate, and a tribute to their British forebears.

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From *the* Cockpit



RICHARD CROCKETT

Join one of Shuttleworth's newest pilots on his vintage flying journey

Asking any Shuttleworth pilot to name their favourite aircraft in the collection is like asking a parent to choose their favourite child. However, if they were to answer, it would probably fall into three parts. First, the favourite among those they've had the privilege to fly; second, the one with the greatest historical significance; and third, the aircraft they one day hope to earn the trust to fly. Like many others, my bucket-list of aeroplanes tends to evolve over time, and I try to keep my thoughts grounded in reality. One such machine on my list was the Miles Hawk Speed Six, which, by the end of the 2024 season, made a magical transition from an aspirational goal to an entry in my logbook.

The Speed Six, one of the collection's more recent acquisitions, is a single-seat, low-wing racing aircraft powered by a de Havilland Gipsy Six. This same, legendary engine also drives two other renowned Shuttleworth racing aeroplanes, the DH88 Comet and the Percival Mew Gull.

Along with many aircraft in the fleet, G-ADGP is a unique survivor — the only Speed Six still in existence. Built in 1935, it was originally Luis Fontés' mount for the King's Cup Air Race. Fontés continued to race 'GP until the war, having numerous modifications made including a revised canopy and,



In occupying the cockpit of the Miles Hawk Speed Six, Richard was following on from some illustrious racing names. DAVE RADCLIFFE

most notably, a reduction in wingspan.

The airframe is pure racer: small, streamlined, and with a look that exudes 160mph even when stationary. Accessing the cockpit involves sliding back the canopy, standing on the seat and lowering yourself into what is a surprisingly deep

aircraft I've come across in my Shuttleworth journey so far.

The Speed Six is equipped with a starter motor, a luxury a lot of other collection aircraft don't have. It can be engaged after the engineers have primed the engine. When it roars into life, you're greeted by the distinctive sound of the six-cylinder Gipsy

air speed quickly builds to a cruise of 135kt. However, with its fixed-pitch propeller, careful attention is required to avoid over-speeding the engine.

Running in for a display, the Speed Six accelerates swiftly, allowing initial passes at around 170kt. This speed enables a pull-up from the display minima of 50ft to over 1,000ft at the apex of a wingover, which beautifully showcases the aircraft's performance and agility.

Eventually, the time comes to land. As you prepare for the circuit, the aircraft must be slowed and the canopy slid back. With flaps and a wing design similar to the Magister, the Speed Six — despite its high performance in the air — can manage an approach speed of just 60kt. Landing is straightforward, and any tendency to swing is easily managed with the aid of the wheel brakes, a particularly handy feature that also makes for reasonably simple taxiing.

The Speed Six is my first racing aeroplane since flying the Comper Swift, and it certainly demands a shift in mindset compared to lower-performance aircraft. Thankfully, despite its significant performance leap, 'GP remains remarkably manageable from a piloting perspective. It's easy to see why so many pilots name it as their favourite — it has certainly earned a place high on my own list!

“It remains remarkably manageable from a piloting perspective”

space. The instrument panel is relatively basic, but one feature immediately stands out: the air speed indicator, which arcs all the way up to an impressive 195kt. This detail alone hints that flying 'GP will be a far higher-performance experience compared to many other

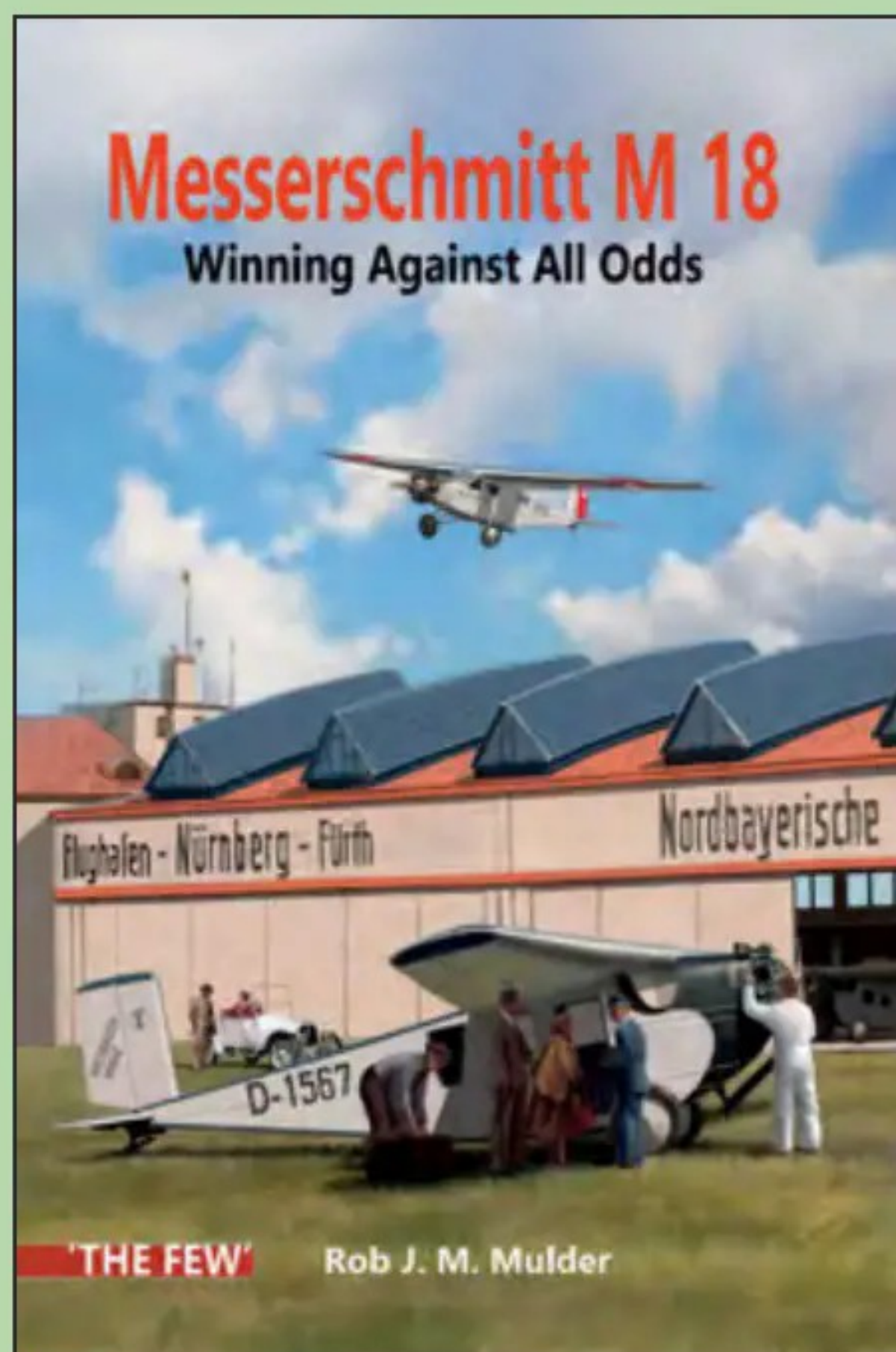
Six, a magical note I'd almost compare to a 'mini-Merlin'.

Once airborne, 'GP truly comes into its own. The initial climb is flown at 85kt, yielding an impressive climb rate of more than 1,000ft per minute. When a safe altitude is reached, the nose is lowered and the

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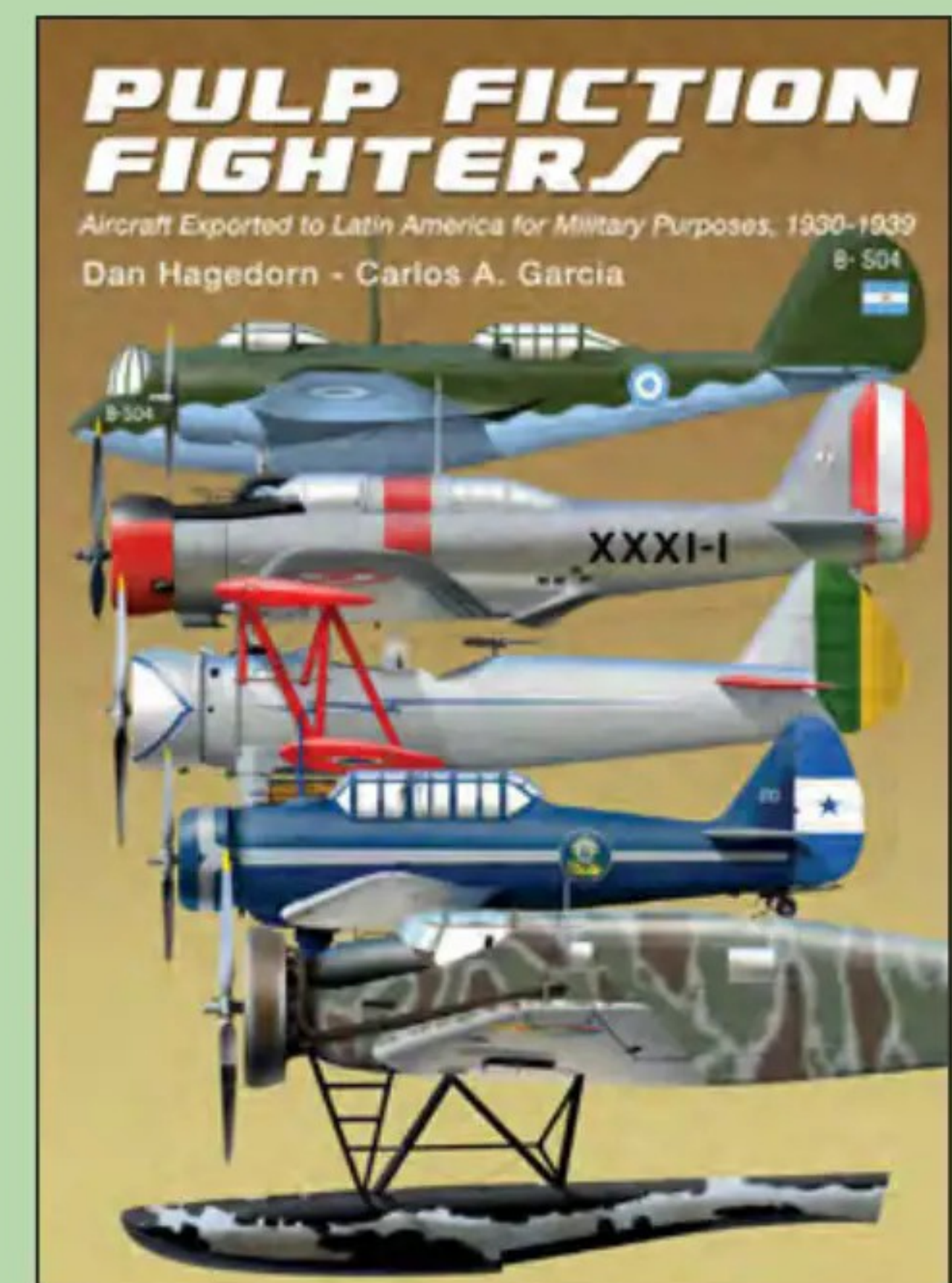
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In every issue, the writer of our Letter of the Month wins a **£25 book voucher** to spend with leading military and transport publisher Crécy.

From mid-1946 the Swedish Air Force bought hundreds of British military aircraft: Vampires, Mosquitos, Spitfires and Venoms. At first onlookers in the UK were confused, astonished and maybe even horrified when the Swedish crews who flew them all home were ferried in aboard ancient German Junkers Ju 86 bombers and a former civilian Ju 86 Z-7 which had been used for night mail deliveries.

Sweden acquired 40 Ju 86 bombers from Germany before the war. The type had won a contract in competition with the Handley Page Hampden. Another 16 were built under licence in Sweden during the war years. The type was given the Flygvapnet designation B 3, B for bomber. By 1948 there were still around 40 B 3s left, but they were no longer needed as bombers, torpedo bombers, mine-layers

LETTER of the MONTH

or for recce missions over the Baltic and North Seas. Some were converted into transports even before the end of hostilities; now the rest received the same treatment.

These outdated aeroplanes became familiar all over Europe in the late 1940s, supporting many tasks: exchange visits to other air forces, annual tours for our air cadets, and inter-European military and civilian athletics events. Examples of exchanges with the RAF were deployments by a squadron of Swedish P-51 (J 26) Mustangs to West Malling in June 1948, described in pictures in the February 2013 *Aeroplane*, and a squadron of Saab J 29s to Waterbeach in October 1953. As usual our groundcrews came in aboard the Ju 86 transports. From 1955 they were gradually replaced by Pembrokes, the last being retired in 1958.

But the Ju 86's history went on, now as objects for fire-fighting practice at air force bases and civil airports. One such was B 3 serial 149, which during 1956 ended up at Kungsängens airport in Norrköping, south of Stockholm. In August 1966 I saw the sorry remains and took a series of photos. My shot of 149 gives a good image of a bomber's transformation into a transport. The dorsal gun position was replaced with a canvas-covered inflated raft. The sides of the bomb-aimer's station received three glazed portholes and behind the port wing an entrance door was installed.

I don't know how long the wreck reminded in situ, but it's certainly been gone for decades. Today I'm very glad I had the opportunity to document the end of an important part of Swedish aviation history.

Lars-Erik Ingerlo

BELOW:
B 3 serial 149 on the dump at
Kungsängens. LARS-ERIK INGERLO



I was interested to read Cliff Jewell's account of working for a Rolls-Royce sub-contractor on the RB211 project in the October *Aeroplane*, and being only an occasional reader of the mag I have obtained a copy of the June issue to read the TriStar Database article for myself. I was an apprentice with Rolls-Royce at Hucknall from 1964 to March 1969 and well remember the excitement when the workforce was gathered together to hear the announcement that the company had won the contract to supply the RB211 to Lockheed for the new TriStar. I could not remember the date but the article confirms it as 1968.

I had managed to achieve my long-time dream to be a draughtsman at Rolls-Royce, and was working in the jig and tool drawing office, mainly designing simple spark erosion fixtures for burning the special pattern of holes in the Nimonic diffuser of the annular combustion chamber on the RB211. I also did some design work on electron beam welding fixtures to hold guide vanes for welding the root. These fixtures were made entirely from non-magnetic stainless steel to avoid distorting the welding beam — expensive!

We were aware of the new material from which the massive fan blades would be made, called Hyfil, which we now know as carbon fibre. I also recall the flap in the office, possibly in late 1968, when several of the 'draffies' were involved in an intensive programme tooling for the alternative titanium blades as the carbon fibre ones had failed on the rain erosion tests. At least, that was the story I was told in the office but I have never had it confirmed. The change was quite a task, being a fully machined component rather than a moulding.

Fortunately I avoided the crash of Rolls in 1971, as I left my job in March 1969 to work as a design draughtsman at a Nottingham-based company making oil and air filters for many cars and commercial vehicles.

Colin West

What a great photograph of an old friend! 'Aeroplane meets... Bob De La Hunt' in the November



The original Super Constellation VH-EAG was an L-1049C, built and delivered in 1954. It was the first and last of the type to serve with Qantas, being retired during 1963 and sold for parts.

2024 issue shows the restored, but unfortunately not the original, Super Constellation VH-EAG. In, I think, 1999 I took a Qantas flight from Sydney to Hong Kong. As the airport taxi drove round the access road, past the maintenance areas, I was amazed to see VH-EAG parked among more modern airliners. When I boarded the Qantas Boeing 747 I wrote a note and passed it to the chief cabin steward: "What is Super Constellation VH-EAG doing in Sydney? I know this aircraft". The steward read the note and said, "I don't know, but I know a man who does."

Once we were at cruise altitude the steward returned saying, "The captain wants to see you", so I found myself occupying the jump seat on the flight deck. I explained to the crew that, in 1957, while I was still at school, I had flown from Heathrow — I remember the check-in tents — to Singapore to visit family. The aircraft was the original VH-EAG. The lengthy journey, with several stops for meals while refuelling, was exciting and eventful. There was a lot of friendly interaction with the cabin crew and some very humorous events.

As I related the tale to the 747 crew there was great amusement because they knew the truth behind some of the stories. When I described the incident when the chief stewardess had lost her hair, apparently a wig, into a ventilation duct, they were falling about, laughing at the controls. They told me the story of the Constellation that had been rescued, full of bird droppings, and restored as VH-EAG. I spent

a very happy two hours in the cockpit, an experience that could not be repeated now. During that time I observed the 747's flight engineer noting down instrument readings. He then performed a manual long-division calculation and passed the answer to the captain. Not a calculator to be seen.

The Singapore flight was a great adventure for me. I can still remember the spectacular views of the Alps from 18,000ft and the bouncing sensation, which lasted more than a week, induced by movement of the Constellation's rear fuselage and the experience of flying into the monsoon over India — just as coffee was being served!

Anthony Knight

I was pleased to see in the October *Aeroplane* a picture of my MG ZB, XDU 127 (page 96, second from the right, maroon and cream for MG enthusiasts). In 1967 I was a member of No 71 Maintenance Unit and one of my jobs was to remove the engines, I think from Vulcan XA898. They were low in hours and had not been abused too much by the apprentices, if at all. They were sent to Rolls-Royce for overhaul. I believe the shortage of Olympus engines was brought on by the change of role of the Vulcans around that time. It was an interesting period as I got to play with the Beaufighter mounted on a hut that was in use as a live classroom. Believe me, when at full power the classroom was 'live' in every sense of the word. It was a real asset as a training aid.

No 71 MU was an interesting place, and the Exhibition Flight

was a very small part of it. We still had lots of work recovering service aircraft for the army and navy, plus civilian crashes as we were the only unit equipped to deal with them at short notice and were able to get to places ordinary folk found difficult. It was at times an unpleasant and sad job, long before PTSD was discovered.

No 60 MU at RAF Driffield looked after the top end of the UK above the Wash and No 420 Repair and Salvage Squadron dealt with 2ATAF from RAF Butzweilerhof. FEAF and MEAF had their own MUs based at Seletar and Akrotiri. These were the days when the RAF had lots of aircraft to play with. Overall, a happy time despite the tasking.

John Sawyer

In answer to the question from your reader Nigel Scrase about the intriguing engine 'tilt' on the S55 flying boat (*Aeroplane*, July 2024, page 25), the reason for the peculiar mounting angle was the need to compensate for the strong pitching moment of the propeller thrust so far above the aircraft's centre of gravity. The propeller flow was orientated towards the horizontal tailplane, thus compensating for any variation of the pitch trim with the engine power changes.

On the original design the engines were horizontal, but the prototype incorporated an upward tilt of around 4°. This proved inadequate and was soon increased to 8.5° nose-up, with reportedly excellent results: the aircraft was described as "stable and steady" during all phases of flight and the landing approach was easy and well controllable. The actual touchdown, on the contrary, was tricky, as the drag of the water caused the short hulls to dive, with catastrophic results if not anticipated and closely checked.

Once its unorthodox behaviour was understood, the aircraft proved to be easy and pleasant to handle, and was well-loved by its crews.

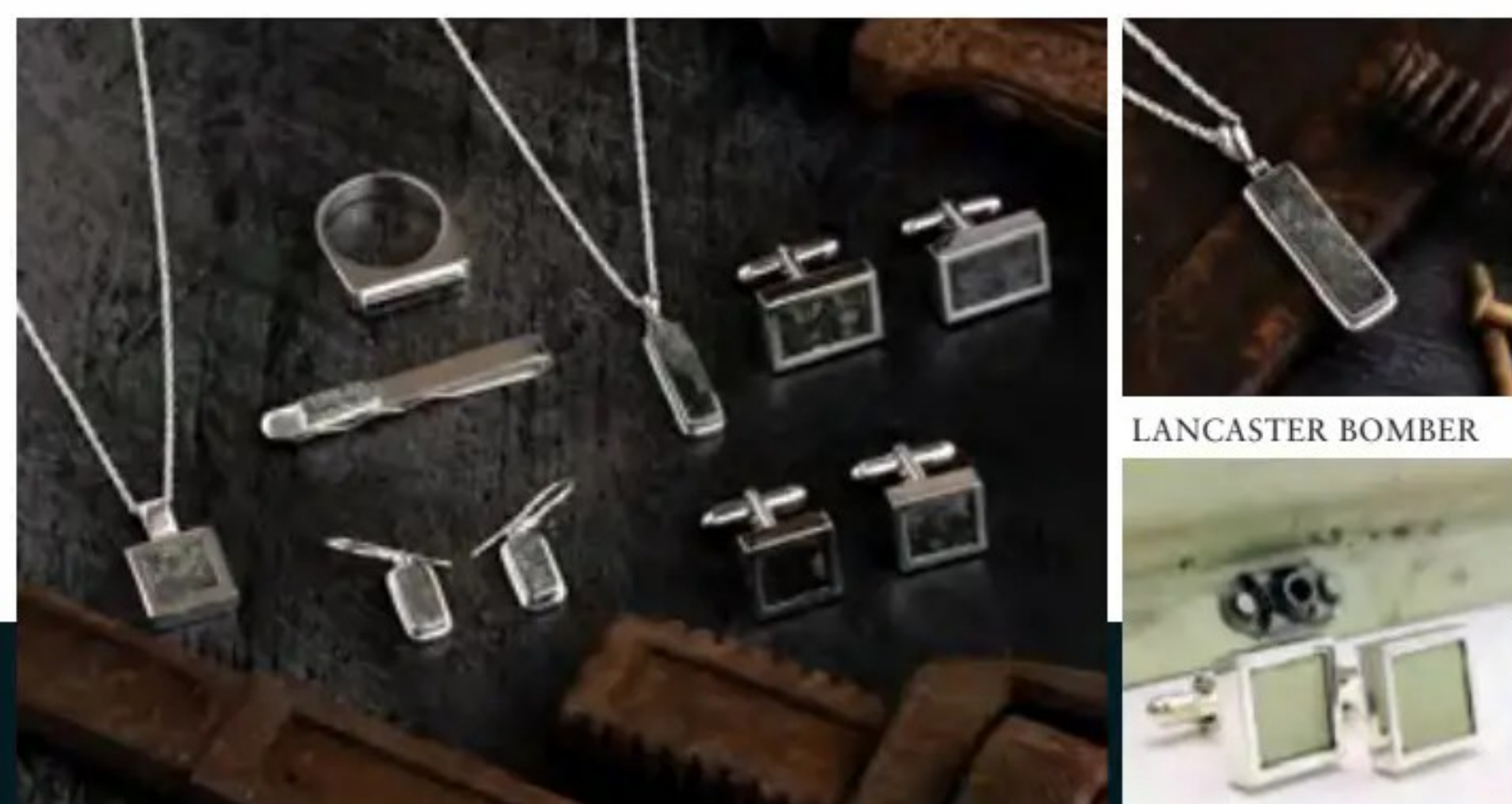
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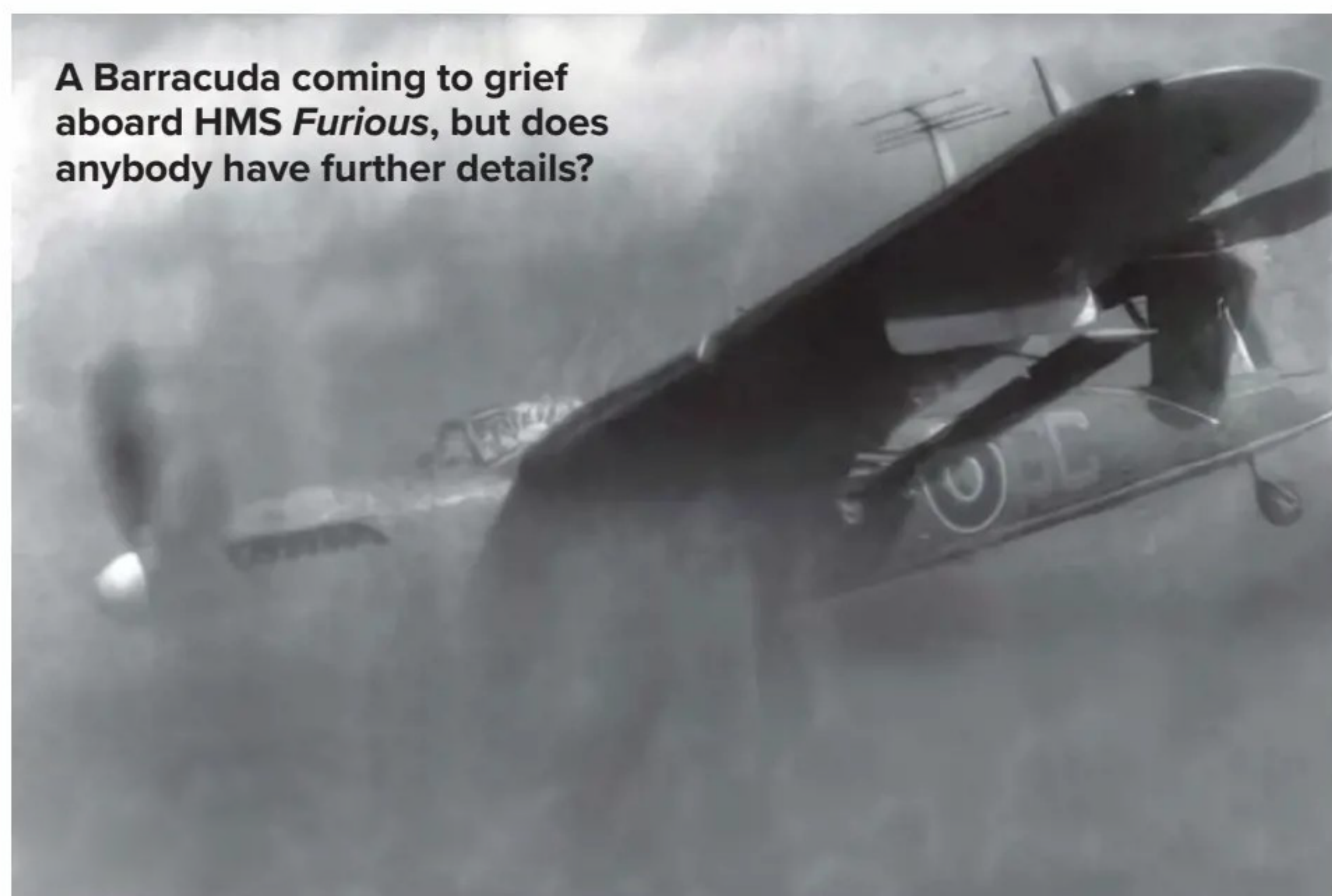
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THIS MONTH'S QUESTIONS



A Barracuda coming to grief aboard HMS *Furious*, but does anybody have further details?

Barracuda mishap

Q Prompted by the Fairey Barracuda feature in September's issue, Dr Roger Poland writes that his late father, Rear Admiral E. N. Poland, served as torpedo officer aboard HMS *Furious* in 1943-44 around UK coastal waters and off Norway. Among his effects was the accompanying photograph, which Roger believes was taken during this period when the ship was involved in the search for and eventual destruction of the German battleship *Tirpitz* — it shows a Barracuda crashing on the flight deck of the carrier. Does anyone know the outcome of this accident, any details of the crew and whether it was lost overboard?



Comet 4B G-APMA, the BEAline Syndicate London-to-Paris air race team — and an incorrect flag?
VIA JOHN CHADWICK

Union flag error?

Q Mike Barrett is taking issue with British European Airways regarding the Union flag on the nose of the BEA Comet 4B pictured on page 74 in the September issue, which he believes is upside-down. He says, "Is this a mistake, or an aeronautical convention of which I am unaware?" Your compiler's immediate response to this is that, if the staff is on the left, the flag would seem to be fine as displayed on the Comet's nose, but if the staff was on the right, in other words at the nose, the flag would be wrong — or at least I think those are the criteria. Clarification would be welcome.

Gatwick's post-war strangers

Q Christopher Harris forwarded the two accompanying photographs for identification. He discovered them in his father's collection and understands they were taken at Gatwick in the immediate post-war period. The only information written on the

reverse of the print showing the aircraft with no wings is "A. J. W Gatwick", the abbreviation probably standing for the AJ Walter company which bought and sold aircraft — military ones in many cases — and survived into the post-war years with a base at the pre-war Gatwick 'Beehive' commercial airport overhauling Douglas C-47s,

among a range of types. One of the aircraft in question is the wingless General Aircraft GAL55 training glider, one of two built in 1943 (NP671 and NP674), and test-flown behind a Westland Lysander before development ceased. The other type is the Miles M.64 two-seat tourer/trainer aimed at the post-war light aircraft market, otherwise

known as the LR5, which made its first flight at Woodley on 3 June 1945. If anyone can enlarge on this information or correct the details given, Q&A would be pleased to hear from you.

Where is Gargunnock?

Q Alan Laird is searching for the exact location of a World War One airfield in Scotland, which he understands is known as Gargunnock landing field and was in use during 1917. He says a simple internet search produces only the name "Kincairn Landing Ground — location unknown", while Ordnance Survey maps both pre- and post-World War One give no indication as to where it was sited. Despite living close to the village and probably within visual range of the aerodrome, ➤



A General Aircraft GAL55 and the only Miles M.64 at Gatwick shortly after the war — but why?

Alan has found nothing to show where it was. He recalls a mention of it in a long-forgotten book, accompanied by details that six de Havilland DH6s were based there for anti-submarine patrols, but no illustrations. Can anyone help?

Seafire or Spitfire?

Looking at the upper picture on page 44 of the October issue, Graham Skillen believes the aircraft nearest the camera is a Spitfire V, not a Seafire. “My logic”, he says, “is that the ribs on the upper wing surface were strengthening resulting from an undercarriage mod. The same strakes appear on the Shuttleworth Spitfire and can also be seen on the accompanying photograph



A closer-up view of the Henstridge-based Seafire, or Spitfire, showing the possible modification. BRIAN CORK



The strakes can be seen on this No 306 Squadron Spitfire Vb, at the left of the picture.

which shows a very well-worn Spitfire Vb of No 306 (Polish) Squadron at Coolham, spring 1944... The panel above the undercarriage tended to buckle, so a slightly thicker gauge was used and the ‘strakes’ were bolted to castings fore and aft

and had a matching ‘top hat’ section on the underside to add strength. On later marks which were heavier and had uprated brakes, appropriate strengthening was built in and the panel slightly bulged to add more strength”. Graham wonders

whether an early Seafire would have been in a low mod state that required correction. Given the likelihood of a hard naval life, he surmises that all Seafires would have been built to the better standard, but can anyone confirm it?

THIS MONTH'S ANSWERS

1918 Camel crash at Montrose

In last month's column, your compiler asked if anyone could identify the flying school at Edzell from which a Sopwith Camel originated, which crashed at Montrose on 9 December 1918.

Aviation historian David Smith says the Camel was from No 26 Training Depot Station, formed at Edzell on 15 July 1918 for single-seat fighter training, mainly with SE5as. It also operated Camels and Pups until disbanding on 25 April 1919.

Family search

Jane Enright sought details in the November issue on the award of the DFC to her grandfather, Sqn Ldr John Fyfe, for operations in India during 1932. She also asked if anyone could provide information into his loss during an attack by No 107 Squadron Blenheims on the French airfield at Dinard on 11 August 1940.

Vic Flintham offers the suggestion that John Fyfe was serving with No 20 Squadron, which in 1932 was busy flying reconnaissance sorties over the Panjkora valley in support of ground forces. The other units, Nos 5 and 28 Squadrons, appeared to be involved in exercises connected

with a big display in Delhi. In answer to the second part of Jane's request, post-war information discovered in German files found Sqn Ldr Fyfe was shot down by a Luftwaffe Bf 109 into the Channel on his way to the target, presumably without being able to contact others on the raid or his base at Wattisham. Of 23 Blenheims assigned to the raid, only nine bombed and one, Fyfe's, was lost.

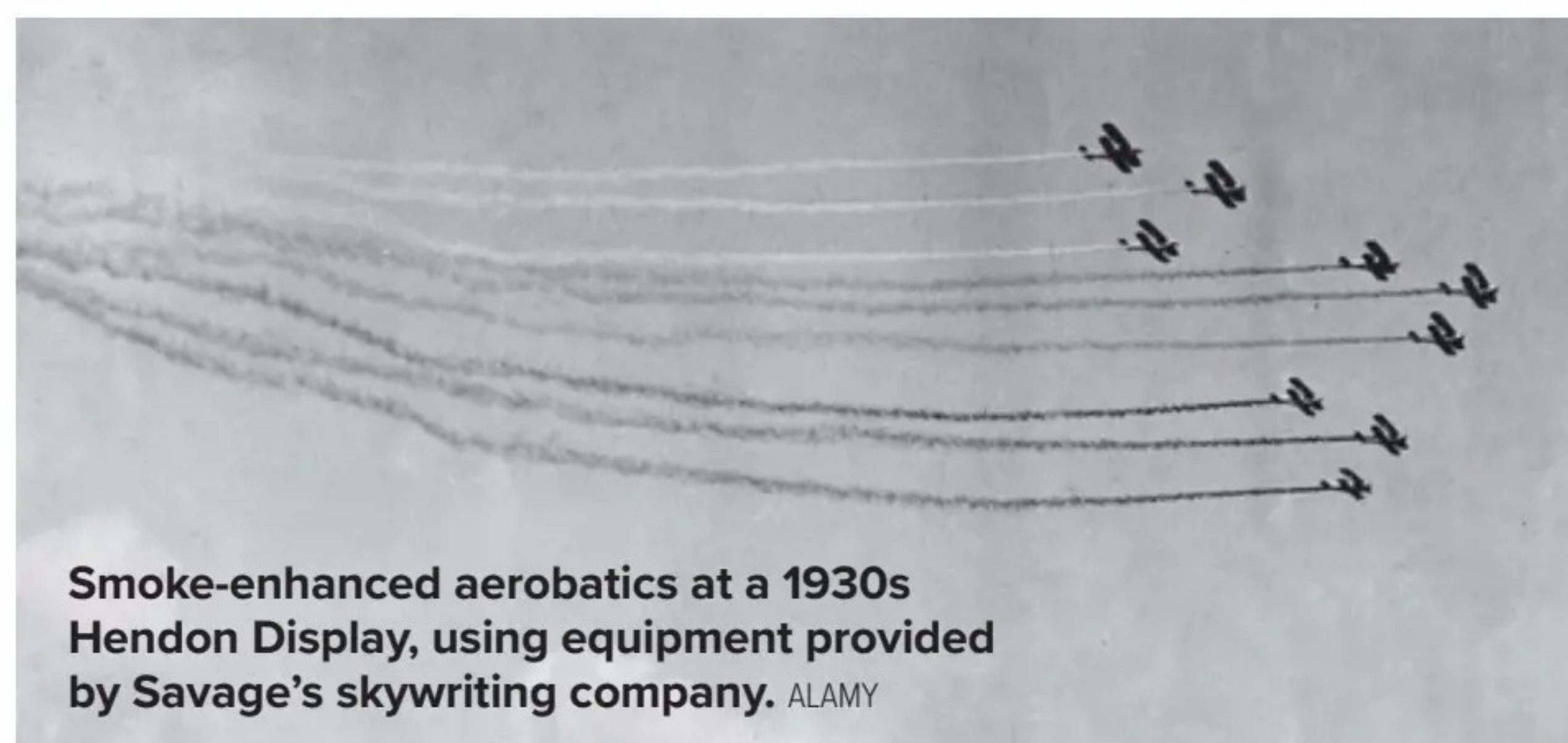
Tower of strength

In the December edition, Geoff Dobson sought the role of a large wooden structure, believed to be connected with parachute training, as well as its location.

Tony Exelby says the tower was part of the Admiralty Research Establishment, now incorporated into QinetiQ, and was used for testing outdoor antenna systems and wavelength trials. It stood at Funtington, West Sussex, along the West Ashing Road and was on the site of an old World War Two advanced landing ground, the main runway of which forms the adjacent road. The tower has now been dismantled, but the QinetiQ establishment remains in use.

Smoke gets in your eyes

A brochure picked up by Charles Harding at the



Smoke-enhanced aerobatics at a 1930s Hendon Display, using equipment provided by Savage's skywriting company. ALAMY

Farnborough Air Show on the smoke-generating equipment produced by the US Sanders company — and outlined in the November issue — indicates that the use of smoke was pioneered at air displays in 1929 by Freddie Lund in the USA. However, Charles suspects it was used earlier, and requested details of when it was first employed for displays in the UK.

At a recent meeting of the Honourable Company of Air Pilots attended by Vic

Flintham, historian Guy Thomas gave a talk on Bentfield Hucks, test pilot and inventor of the Hucks Starter, who collaborated in 1918 with Maj John Clifford (Jack) Savage to inject paraffin oil into hot aircraft exhausts. The paraffin oil vaporised at 1,500° to produce white smoke in the slipstream of the aircraft and Savage went on to use the process for skywriting. The RAF Displays at Hendon witnessed such visual effects, but are there earlier instances?

CORRECTIONS AND CLARIFICATIONS

• Randall Volpe writes with reference to the photo caption relating to the USAF C-131A on page 75 of the November edition. The serial is not prefixed with an O for ‘obsolete’, but is a 0 (zero), denoting a serial 10 years or more old.

• In the background of the picture on page 36 of November's magazine, showing Dirk Bogarde photographing a scene being shot for *Appointment in London*, can be seen a tall gentleman wearing a bow tie — none other than John Wooldridge, the subject of the feature in question. His son Hugh also notes that John's book *Low Attack* has just been republished in a brand-new edition by Sapere Books.

• Tony Brown says the ‘frisbee’ fairing on the TWA TriStar, N31030, pictured on page 28 of the September issue indicates it is an L-1011-200 model.



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A STAR is REBORN



This Slingsby-built SE5a replica was created especially for the movies. Now, for the first time since it left these shores for film stardom, it's flying again in Britain. The man behind the project tells its story **WORDS:** MATTHEW BODDINGTON

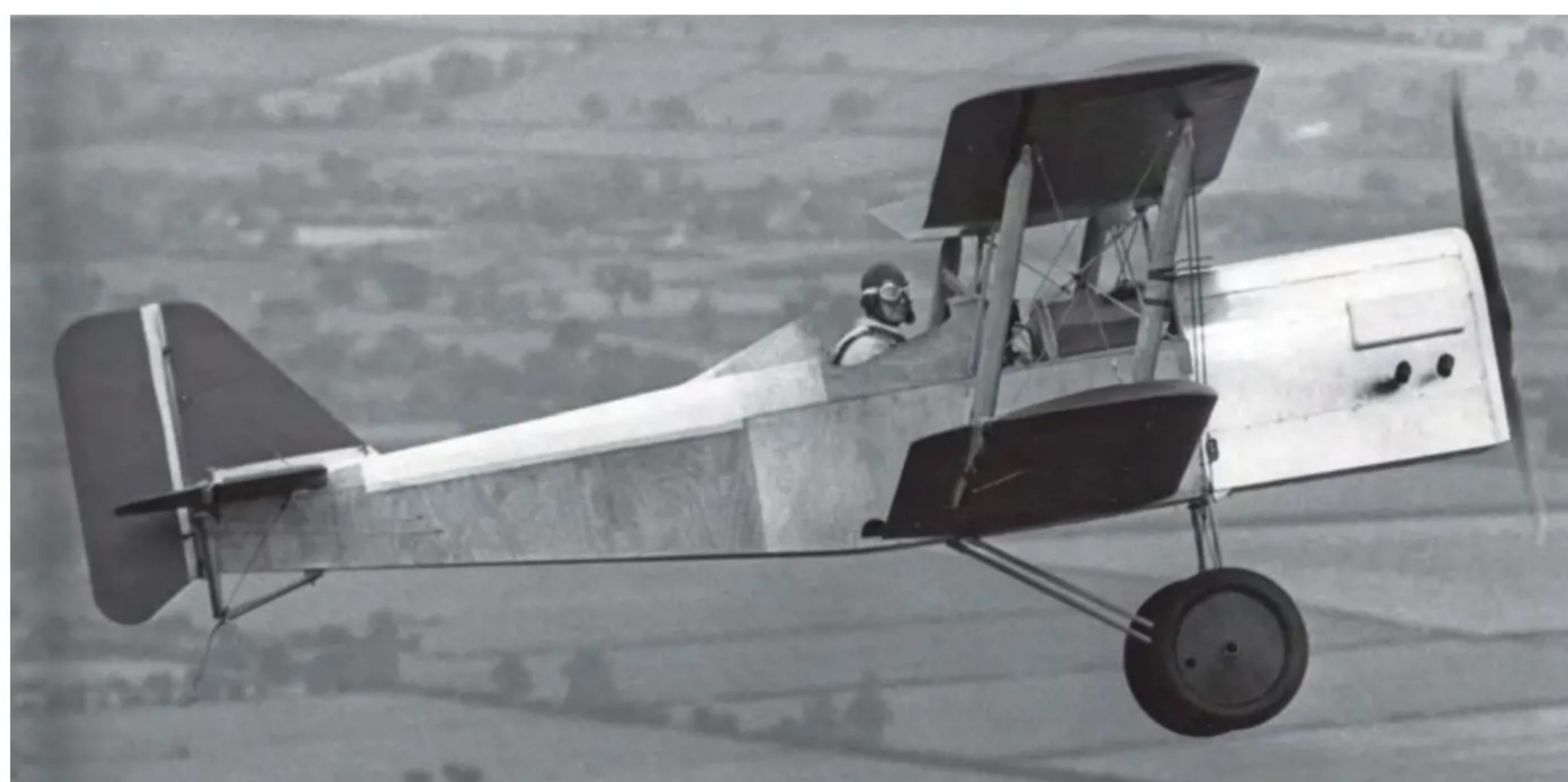
After the film *The Blue Max* was released in 1966, many studios wanted to cash in on the success of the World War One flying epic. The following year Blake Edwards signed a deal to direct four movies for Paramount Pictures. One was *Darling Lili*, starring Julie Andrews — his soon-to-be wife — as a Mata Hari-type double agent.

For the flying scenes it was planned to employ the replicas built for *The Blue Max*, which had been purchased by colourful Canadian pilot and businessman Lynn Garrison and were stored in Ireland awaiting their next assignment. But apart from two full-size SE5a replicas constructed by F. G. Miles Engineering, they all represented German aircraft. For *Darling Lili*, further British machines were needed. Although more modern Tiger Moths and Stampses could step in they didn't look quite right, and those used in *The Blue Max* had either been sold off or returned to their owners, who were reluctant to rent them out again. Also, with their swept-back wings and streamlined engine cowlings they were hard to disguise as 1914-18 fighters!

F. G. Miles Engineering was approached to see if it could build more SE5as. The company was happy to do so, but the cost had increased considerably. A cheaper solution was required. Renowned film flyer and glider exponent Derek Piggott was chief pilot for the production, and he started to look for alternatives. One he came across was the Currie Wot homebuilt, a single-bay biplane of all-wood construction with no stagger and straight wings. He investigated whether, by altering the shape of the wingtips, rudders and engine cowlings, the outline of the aeroplane could be changed to resemble an SE5a, thus matching the two existing Miles-built *Blue Max* replicas and coming out at around 0.83 per cent scale.

As well as having flown extensively for the cameras in *Those Magnificent Men in Their Flying Machines*, Derek had a long-term association with well-known glider manufacturer Slingsby Aircraft at Kirkbymoorside. It was asked if it would be interested in manufacturing the new aircraft and could complete them within the timescale required.

The building of the six Slingsby T56 SE5a replicas is covered in Derek's excellent book *Delta Papa*,



so I won't go into all the fine details here, but suffice to say he did have one regret. It was thought a minor increase in fuselage width would hide the 110hp, flat-four Lycoming

“The aircraft ended up being wider than a full-size SE5a”

O-235 engine. What looked like a small amount on paper was in reality quite a lot, and the aircraft ended up being wider than a full-size SE5a. By the time Derek realised the error it

was too late, and there was no time to rectify the mistake as the fuselages had already been built and the schedule was so tight nothing could be done about it. The broad nose is a distinctive feature of the aeroplane, but Derek was a little disappointed with the performance deficit the extra drag caused.

Although the T56 is based on the Currie Wot drawings, they are completely different aircraft. The wingspan is the same, but the chord of the wings was increased to give the distinctive SE5a shape. The Wot has no stagger, but the Slingsby aeroplane does, to more closely resemble the Royal Aircraft Factory original. The wings are of a deeper section and the fuselage is slightly bigger — in fact, everything is slightly bigger. Overall, there is ➤

TOP: Some of the 'Mini SE5as' outside the Slingsby factory at Kirkbymoorside during construction.

VIA MATTHEW BODDINGTON

ABOVE: It is not known which of the T56s this is undergoing flight-testing, given the lack of any identifying markings. GETTY

OPPOSITE PAGE: The author at the controls of Slingsby T56 SE5a replica 'C8846'/G-AVOU for its first air-to-air shoot during late October. DARREN HARBAR

PRESERVATION HISTORY Slingsby SE5a

A six-strong SE5a replica flypast at Weston as *Darling Lili* is shot, with EI-ARI — the subject of this article — just visible fourth from left. VIA MATTHEW BODDINGTON



For *You Can't Win 'Em All*, the plot of which involved two American mercenaries involved in the latter stages of the 1918-22 Greco-Turkish War, the two 'Minis' involved were put into the period markings of the Turkish air arm. Ironically, the film was forbidden from release in Turkey — despite so much of it being shot there — for many years due to controversies regarding the script. VIA MATTHEW BODDINGTON

very little remaining of the Wot, but the lineage is still there.

The six aircraft were approved under a permit for film flying by the then Air Registration Board and registered G-AVOT, 'AVOU, 'AVOV, 'AVOW, 'AVOX and 'AVOY respectively. They were built in record time, with the first three arriving in Ireland late one evening in 1967 and the final three a week afterwards. Ownership transferred to the production company and they went onto the Irish register as EI-ARH, 'ARI, 'ARJ, 'ARK, 'ARL and 'ARM respectively.

Mostly mounted out of Weston and Baldonnell, only a few miles apart to the west of Dublin, filming for *Darling Lili* lasted many months and hours of aerial sequences were shot. The new 'Mini SE5as', as they were referred to, performed very well and soon became firm favourites with those who flew them — except for Derek Piggott and my father Charles Boddington, several other civilians were involved, together



with some pilots from the Irish Air Corps. They proved to be ideal movie aircraft, with their low speed and tight turning circle.

Once all the footage was in the can, the six Slingsbys were put into store at Weston, where the remainder of the *Blue Max* stable was kept by Lynn Garrison. In the years that followed they were taken out on numerous occasions for involvement in several other feature films. EI-ARI and 'ARJ' were taken to Turkey for 1970's *You Can't Win 'Em All*, starring Tony Curtis and Charles Bronson. Flying was carried out by Derek Piggott, Lewis 'Benjy' Benjamin and my father. 'Benjy' wrote a great article for *Aeroplane* a few years ago about his experiences of the production.

Back in Ireland the whole fleet was brought out of retirement for a movie with Cliff Robertson called *I Shot Down the Red Baron, I Think*. Sadly, it never reached the screen due to many factors. The footage shot for it still exists, and if anyone knows

how to process 35mm film, do let me know via the editor.

The *Blue Max* aircraft and the six 'Minis' were again in action during 1970 for *Von Richthofen and Brown*. At the same time, *Zeppelin* was being filmed and the 'Minis' and two full-size SE5as were loaned out

“ They were ideal movie aircraft, with their tight turning circle ”

to that production. Sadly, one of the Miles-built aeroplanes collided with the Alouette II camera helicopter, killing all on board. One of those in the helicopter was Burch Williams, who was also the producer of *I Shot Down the Red Baron, I Think*. His death was one of the reasons it was

never completed. Only a few weeks later, the second Miles SE5a was lost in a fatal accident while making *Von Richthofen and Brown*, claiming the life of my father.

The aircraft were all placed in storage when filming concluded. *Von Richthofen and Brown* was to be their final big-screen appearance — well, sort of. The 'Minis' did feature once more in *Aces High* by virtue of the fact that footage originally shot for both *Darling Lili* and *Von Richthofen and Brown* was edited into the final picture for the big dogfight near the end.

In the mid-1970s two of the 'Minis', EI-ARH and 'ARM', were loaned to Frank Tallman for *The Great Waldo Pepper*. Although they are not seen flying in the final edit, they are visible in the background, and in the hangar of the World War One film shoot scenes where Waldo flies the Sopwith Camel against Ernst Kessler, the German ace, in his Fokker Dr.I. But following the loss of Tallman in 1978 and the closure of the

ABOVE:
The *Darling Lili* aircraft wore a tremendous array of colour schemes, EI-ARI sporting serial A4850. It's the fourth along in this line-up at Baldonnell.

VIA MATTHEW BODDINGTON

A flying view from *You Can't Win 'Em All* with Charles Boddington in the cockpit, peering over the side at the camera. After the aircraft were air-tested at Ankara Airport, they flew to Nevşehir for location filming. VIA MATTHEW BODDINGTON



Two T56s airborne as a pair for the *Von Richthofen* and *Brown* cameras. VIA MATTHEW BODDINGTON



In storage on the Slazenger family's Powerscourt estate, near Ireland's east coast not far south of Dublin, the condition of EI-ARI really deteriorated. VIA MATTHEW BODDINGTON

Tallmantz Collection, these two T56s disappeared, though one appeared fleetingly in an episode of the TV series *Fantasy Island*. Where are they now, I wonder?

As for the other four, they enjoyed another, brief outing in a Solvite TV advert for which they were covered in wallpaper. They and the *Blue Max* aeroplanes were disassembled in the late 1970s and transferred to long-term storage in a hangar on the Powerscourt estate in County Wicklow. At one point part of the building collapsed, causing damage to some of the airframes. Lynn Garrison still owned them until the early 1980s, when he sold the collection to the Fighting Air Command in Denton, Texas. The remaining T56s were registered in the US, EI-ARI as N908AC, 'ARJ becoming N909AC, 'ARK taking up N910AC and the new identity of 'ARL being N912AC. Only N908AC was to fly for a limited time with the FAC before being sold on.

Their history from this point becomes a bit sketchy. Again, should any readers possess additional information or pictures, please do get in touch. What has been confirmed is that at one time they were with the Frank Ryder collection in Guntersville, Alabama. We are led to believe that two T56s are held in store by Planet Hollywood — are these the ex-Tallmantz aircraft?



As for the rest, nothing was known until I wrote an article for *Aeroplane* about my experiences as a small boy on the set of *Darling Lili*. At the end I included a summing-up of where the aircraft were now and asked if anyone knew the whereabouts of the Slingsby SE5as. I was contacted by a chap in the USA by the name of Greg Dart, who said he owned two. To begin with I couldn't believe it was true, but he sent me some pictures and it was obvious he did indeed have the aeroplanes. The examples in question were N908AC and N910AC.

I had been in contact with Lynn Garrison and his son Patrick over their missing Bitz-built Fokker Dr.I — another story entirely — so I mentioned to Patrick that Greg had two of the Slingsbys. With that, Patrick went to see Greg and arranged to buy them both. Once he had the airframes in Oregon he offered me one to bring back to the UK and gave me the choice of either. But which was it to be?



LEFT:
The Currie Wot-based T56 came out at roughly 0.83 per cent of a real SE5a's scale. DARREN HARBAR

My father had flown them all, so that wasn't a part of the decision. With a bit of research I worked out N908AC was EI-ARI, one of the pair that went to Turkey for the filming of *You Can't Win 'Em All*. Through further investigation — not least talking to 'Benjy' — I found out this was the aircraft my father had flown on that production, and I had a picture of him standing with it there. It was the only one to fly in the USA and, compared to the others, had not had any major rebuild work done on it there, so it was more original. The decision was made: N908AC, EI-ARI, G-AVOU, c/n 1591 it was.

After the initial purchase, the Slingsby sat in Oregon awaiting the time when I could afford to ship it back to the UK. Over a coffee at Sywell two long-time family friends, Tim and Nick Ravine, expressed an interest in buying a share, and then another mutual friend, Mark Johnson, asked if he could be involved too. Four shares were duly set up, with all parties assisting in the rebuild.

Shipping was arranged and Patrick kindly packed it into a 20ft container. The T56 was on its way back to the UK, arriving at Sywell in May 2015. When it was unloaded and put into the hangar, my first impression was that it was bigger than I expected. Now the hard work would begin to get it back into the air.

“A chap in the USA said he owned two. I couldn't believe it”

None of the original Slingsby drawings survived as they were lost in a fire at the factory at Kirkbymoorside in 1968. A set of Currie Wot plans was obtained for reference and the differences — which are quite extensive — were drawn up by Mark Johnson as

specific T56 drawings. The aircraft was registered with the CAA and took up its original identity as G-AVOU.

In registering the project with the Light Aircraft Association, its former chief engineer Francis Donaldson came to look it over. Now a consultant engineer to the LAA, Francis had been very encouraging when I mentioned bringing one of the Slingsby SE5as back to the UK. In 1968, when the Slingsbys were built, they were approved by the then Air Registration Board and given a permit for film flying, as many film replicas at that time were. Although Derek Piggott had intended the T56 to be robust enough to withstand the rigours of movie work and the six replicas had flown around 200 hours each, it was still a new type on the LAA permit system, so the whole airframe had to have a stress analysis done. Carried out jointly by John Tempest and Ben Syson of the LAA with the assistance of Francis Donaldson, this took in excess of two years to complete, and

BELOW LEFT:
The aeroplane about to be crated up in Oregon, ready for its return to the UK.

VIA MATTHEW BODDINGTON

BELOW:
January 2016, and in the author's Sywell workshop the fuselage is in the process of being covered.

VIA MATTHEW BODDINGTON



PRESERVATION HISTORY Slingsby SE5a

RIGHT, TOP TO BOTTOM:
The late Mark Johnson with the aeroplane on which he spent so much workshop time in his latter years.

VIA MATTHEW BODDINGTON

Ready for an initial roll-out just before Christmas 2016.

VIA MATTHEW BODDINGTON

A November 2021 view of progress, with the freshly fabricated engine cowlings still to be completed.

VIA MATTHEW BODDINGTON

when finished some changes were required before the aircraft could be approved. These were duly designed, accepted and carried out.

G-AVOU needed a thorough inspection and restoration, and the airframe was completely stripped. The fuselage skins aft of the cockpit and the underside were removed and replaced, while all the metal fittings were taken off, inspected and either cleaned and repainted or replaced with newly made items. Likewise, removal of the controls allowed them to be cleaned, inspected and refitted. The final stage saw the entire airframe being re-covered and resprayed.

The original powerplant was long gone. Originally it used a 110hp Lycoming O-235, but these engines had been stolen while the aircraft were in store at Powerscourt — another mystery surrounding the collection there. All the indications were that they had been a little underpowered, and discussions with Francis Donaldson resulted in a search for a Lycoming O-320 but to no avail. Then a chance chat with an old family friend led to the acquisition of a zero-timed, 140hp Lycoming O-290-D2. Being heavier and producing more horsepower, this led to yet more stress calculations on the engine mount and the fuselage firewall.



Slingsby had designed the T56 with ailerons on the bottom wings only for speed of construction, but it made those for the upper ones and bolted them in place to give the appearance of upper ailerons. During the rebuild it was decided to have ailerons on all four wings as per the original SE5a — and, of course, there had to be another round of stress analysis.

Wire bracing is used for the Currie Wot's flying wires. The T56 has streamlined flying wires, the sizes of which had been confirmed during the stress analysis, but the originals were either in poor condition or missing so new ones had to be sourced. Russ Ward in New Zealand was contacted and provided not only fantastic stainless-steel streamlined flying wires at a good price but also a fantastic service.

One question — among the most important in any restoration — surrounded the colours the aircraft should be finished in. There was a thought that it should wear its *Darling Lili* markings, but since this



was not a genuine World War One scheme it would not be acceptable to the authorities in terms of awarding a dispensation. World War One ace 'Mick' Mannock had lived in Wellingborough, not far from Sywell, so one of his mounts was an obvious choice. Research was carried out and the plan was to finish G-AVOU as Mannock's famous No 74 Squadron aeroplane, D276/A. This changed when in 2020 we were all dealt a huge blow. Our dear friend and partner in the project Mark Johnson sadly passed

away after being diagnosed with pancreatic cancer, so to honour him the livery was switched to a No 1 Squadron aircraft in France during 1918 carrying the code 'M'.

On completion of the major structure, attention turned to making new engine cowlings. To hopefully make the wide, flat nose look better, a new nose bowl was designed based on the earlier Hispano-Suiza-engined SE5a. Hopefully this would blend the nose into the fuselage a little. Dummy cylinders and exhaust pipes were built and added to



As the Bedfordshire trees turn golden, the 'Mini SE5a' shows off the No 1 Squadron markings with code letter 'M', chosen in honour of Mark Johnson. DARREN HARBAR

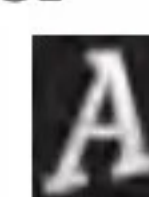


complete the look, while Vickers and Lewis machine guns had to be constructed as the original film items had, again, disappeared long ago.

With the aeroplane finished apart from some minor tinkering, it was weighed and a weight and balance report raised. We had no previous information regarding the T56's weight and balance, so we had to start from scratch and come up with what we thought was a safe place to begin. From there the centre of gravity limits could gradually be explored a little.

Finally all parties were happy and a permit flight release certificate issued for test-flying. The Slingsby took to the air on 23 April 2023, the first time it had flown in the UK since 1968. The overalls Mark wore every day he spent working on the aeroplane were rolled up and placed in the rear locker so he could come along for the ride. The LAA flight test programme was completed and the aircraft flown by Dan Griffith who provided an independent report. In October 2023 it received a full LAA permit to fly.

The SE5a is a joy to fly and will provide many happy hours of enjoyment. It joined the Great War Display Team for the 2024 season and can be seen at airshows around the country. In September it visited the LAA Rally at Leicester and was awarded two awards, for Best Factory Classic and Best Replica. It is hoped the 'Mini' may well appear on screen once again, for a TV appearance is already in the offing. How appropriate this would be for an aircraft that wouldn't exist were it not for the movies.



ABOVE LEFT: Matthew after the Slingsby's first flight, with partners in the project Nick and Tim Ravine.

VIA MATTHEW BODDINGTON

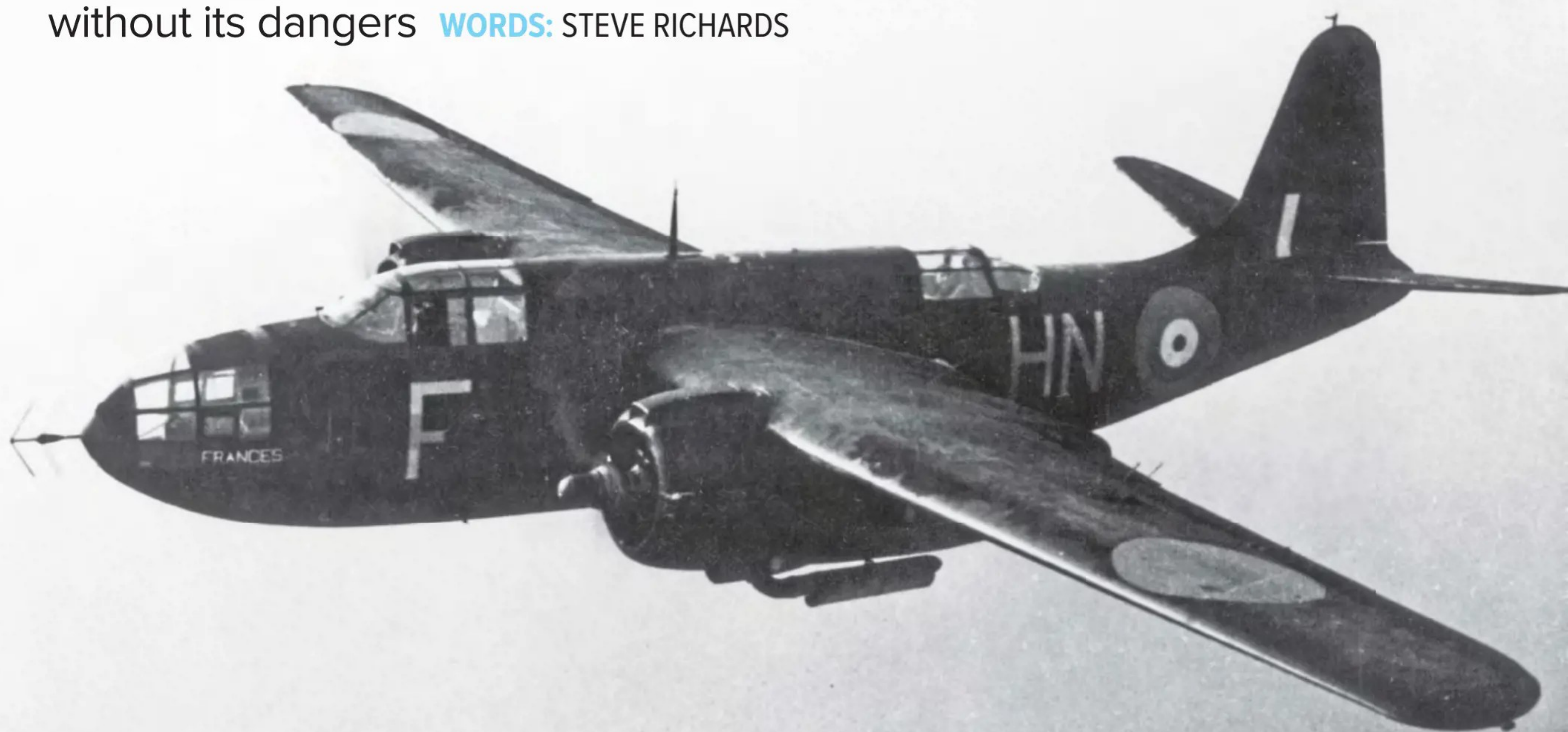
ABOVE: While the broad nose profile is retained, the redesigned nose bowl creates a somewhat more elegant look.

DARREN HARBAR



DANGER! MINES!

Of all the ways in which RAF aircraft claimed aerial victories during World War Two, the use of the long aerial mine was among the most unconventional. But its employment wasn't without its dangers **WORDS:** STEVE RICHARDS



“One flew alone in the Harrow, which meant that during the long climb to height and the subsequent wait for the enemy one felt rather lonely. The clumsy Harrow was not an ideal machine to go to war in. It was very slow and, because there was no heating and the cockpit sealing was often poor, very cold at high altitude. When the radar controller saw a likely-looking enemy bomber coming in my direction, he would direct me on to an intercept heading to one side and about 1,000 feet above the intended victim. At the critical moment I would receive the order to turn sharp left or right, so as to bring me across the path of the victim. Then I would start the ‘Mickey Mouse’ — the clockwork unit which released the bombs at the correct time intervals...”

Flt Lt Dennis Hayley-Bell was recalling to author Dr Alfred Price his time with No 93 Squadron. He was one of a handful of pilots engaged in laying a curtain of airborne mines in the path of approaching Luftwaffe bombers during the winter of 1940-41.

During the immediate pre-war years, and into the first years of the conflict, the idea of bringing down enemy aircraft with aerial mines was given much consideration. Such weapons were to be suspended beneath parachutes or floated below rubber balloons. Rocket-projected parachute mines, launched from land or sea, were also tried.

Fg Off Johnny Kent was posted to the Royal Aircraft Establishment at Farnborough in October 1937. He conducted hazardous research, deliberately colliding aircraft into suspended cables. Initially he was flying the Fairey P4/34, K5099, and then examples of the Vickers Wellesley, Wellington and Fairey Battle. Most of the work involved static cables suspended from balloons or projected into the air by rockets, but he also tested the effectiveness of the short aerial mine and long aerial mine. Short aerial mines involved parachutes and 100ft of piano wire linked to an explosive device, which were to be deployed by RAF bombers when under attack from pursuing fighters. The long aerial mine used 2,000ft of wire and was to be deployed in front of attacking bombers before they crossed the English coast.

Johnny Kent said in his memoir *One of the Few*, “One of the most

astonishing things about the collisions was the speed at which things happened. This was brought home to me very early on when colliding with one of the long aerial mines; my speed was about 300mph and one quite clearly saw the cable approach the wing; then, as I looked out along the port wing I saw the aileron shatter and, at the same time, felt a jerk on the control column, but at no time did I see any sign of the cable actually on the wing or any sign of the bomb attached to it. On return to Farnborough, however, the film was run through and I was

“I was amazed to see the cable and bomb had gone round the wing”

amazed to see that the cable and bomb had gone right round the wing two and a half times, the bomb striking the underside of the wing before the cable unwound itself. This all happened at terrific speed of course — it looked fast even on the film, which reduced the actual speed to very slow motion.”

Many of the tests involved basing appropriately modified research aircraft at Mildenhall while the various cables were airborne over nearby Lakenheath. Having carried

out 300 collisions with cables of different types, Kent was awarded the Air Force Cross before being posted to No 19 Squadron.

Experiments with laying long aerial mine barrages were conducted during the summer of 1940 by a Royal Aircraft Establishment section at Martlesham Heath and a Chain Home Low (CHL) radar station at Walton-on-the-Naze. Handley Page Harrow IIs were employed with a Fairey Battle as a fast-moving target. To pursue this research further, No 420 Flight was formed at Christchurch under Flt Lt Pat Burke on 29 September 1940, when it moved to the operational airfield at Middle Wallop. The general direction of this experimental activity was in the care of Air Marshal Sir Philip Joubert de la Ferté.

The idea of dropping aerial mines ahead of enemy formations flying by day had been around for a while. With German night attacks increasing from 7 September 1940, it was revisited. Luftwaffe night bombers tended to approach the UK crocodile-fashion, one behind the other. Laying a curtain of parachute mines across the path of an approaching aircraft would, it was hoped, stand a good chance of making contact and critically damaging the bomber.

After experimentation, the design settled on for the long aerial mine worked thus. The weapon was fitted into a cylindrical container 14in long by 7in in diameter, and weighed 14lb. After release from

OPPOSITE PAGE (TOP):

An indication of how dangerous the long aerial mine could be: the damage caused to Harrow K6994 on 26 October 1940 by mines exploding within the airframe.

JACK LISTER

OPPOSITE PAGE (BOTTOM):

This No 93 Squadron, coded HN-F, was named *Frances*. KEY COLLECTION

BELOW:

When Johnny Kent deliberately collided with a long aerial mine, he was flying Fairey P4/34 K5099, or a Fairey Battle.

AVIATION PHOTO COMPANY





ABOVE: Harrow K6993, leading this formation, was among the aircraft allocated to No 420 Flight. Here, though, it's in pre-war service with No 214 Squadron. *AEROPLANE*

ABOVE RIGHT: LAMs mounted inside the bomb bay of a Harrow. *VIA STEVE RICHARDS*

the aircraft the weapon dropped and was slowed by a parachute. It comprised, from top to bottom, the supporting parachute, a length of shock-absorber cord, the cylindrical container, the AAD (Armament Air Defence) bomb/mine together with its small parachute, 2,000ft of piano wire and, at the bottom, a drogue (furled) parachute.

When an aircraft struck the piano wire the shockwave ran up the wire, causing the weak link to break, severing the main supporting parachute and the cylindrical container. As the container fell away the bomb was armed and the small stabilising parachute connected to the weapon deployed. Simultaneously, the shockwave travelled down the piano wire, leading the lower parachute to open and pass beneath the target. This drogue parachute, now positioned behind the target, pulled the bomb down onto it.

The Harrow was modified to carry 120 long aerial mines (LAMs) weighing nearly 1,700lb. Once the aeroplane had been positioned to lay its weapons across the path of the incoming enemy bomber, the pilot activated a clockwork unit, which released the bombs at the correct time intervals of just under one second. For operations the spacing between individual mines was 200ft. In this way, the Harrow's complement would produce a curtain in excess of four miles long and 2,000ft deep. The individual mines descended at about 1,000ft per minute, hence the curtain remained effective for about two minutes.

On 1 October, Harrow K6994 arrived at Middle Wallop from Farnborough, but it returned the following day as the starboard generator required attention. Back



at Wallop, racks were loaded with 160 LAMs, which were hoisted onto the Harrow, but the lack of an IFF (identification friend or foe) device precluded any live test from happening that night. The aircraft's existing radio equipment was suitably adapted to transmit its IFF, while for emergencies the VHF radio was tuned to the frequencies being used by Nos 604 and 609 Squadrons which also flew from the Hampshire airfield.

Just days later an electro-mechanical unit (EMU) failed and a mine fell from the parked Harrow. Fortunately, having been left alone for 10 minutes, the thing didn't

“The Harrow's mines produced a curtain more than four miles long”

explode. An expert by the name of Mr Owen arrived from Farnborough to assess the situation and produced a somewhat negative report itemising failures in the preparation of mines. He concluded, “The operation of making one mine ready for dropping took approximately 10 minutes under good conditions of light and warmth. That is 27 men hours work for this operation on one load. In my opinion, this operation should not be undertaken by untrained crews, and is quite impossible except under good conditions of light and warmth.”

Half a dozen armament specialists from Farnborough came to Middle Wallop the following day to fuse one load of mines, allowing an

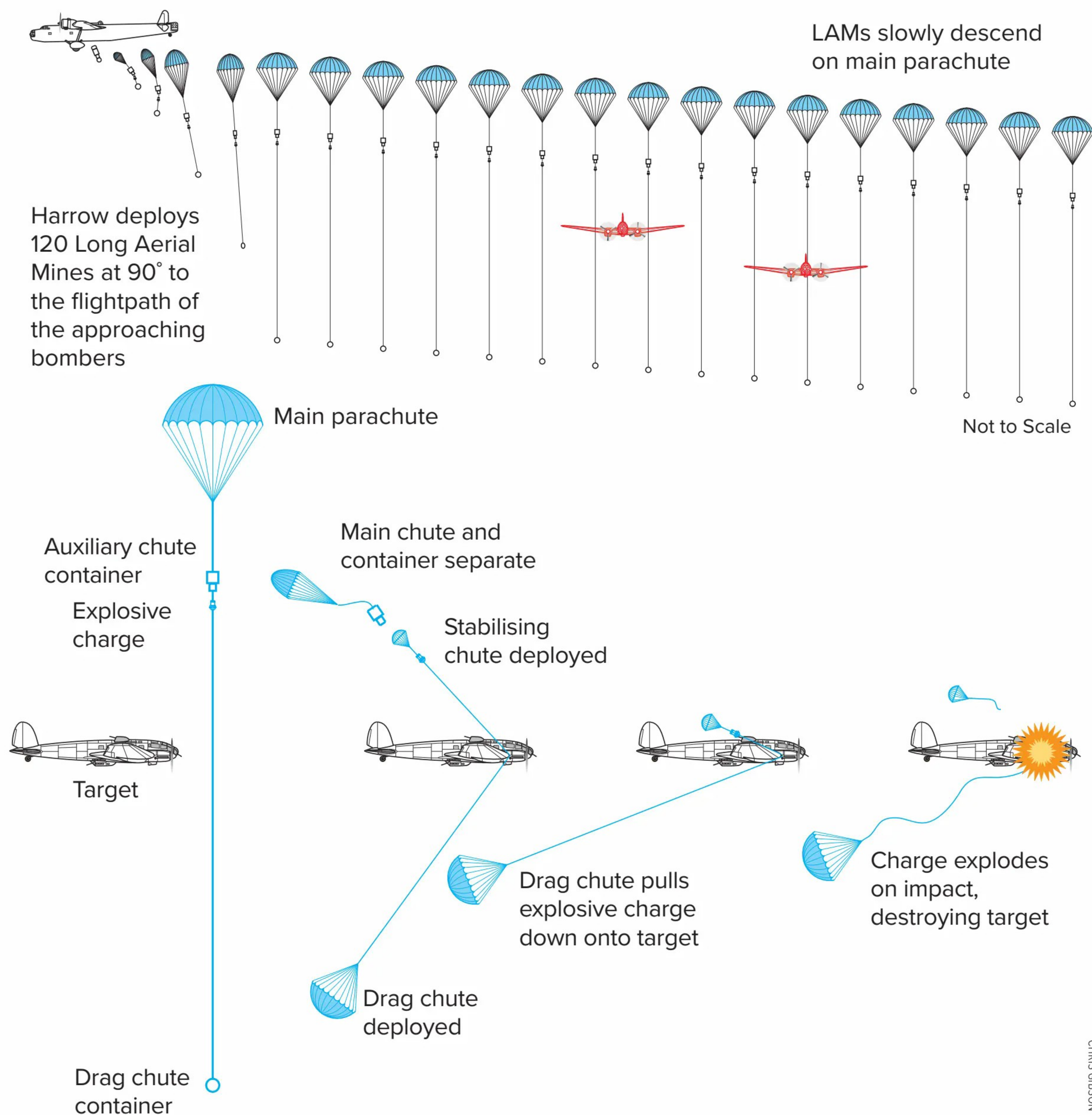
operational flight that evening. Burke reported, “no interception attempted, but operational flight afforded valuable experience. Aircraft attained 20,000 feet in about 45 minutes and at the end of the patrol had reached exactly 25,000 feet. The ‘cockerel’ [what this refers to is unclear], VHF, heated pitot head and heated clothing all worked very well. The positioning searchlight at Worth was used very little.”

Worth Matravers was the main research radar station, including Chain Home and Chain Home Low installations, with which No 420 Flight was to work closely. Someone who worked with the facility described it as, “a conglomeration of huts, laboratories, reflectors and curiously shaped radar aerials, which sat incongruously in the middle of England's most beautiful bit of country.”

A handful of attempts to make a successful operational flight were repeatedly hampered for the next couple of weeks by bright moonlight, or low cloud, fog, rain and a lack of enemy targets showing up. On the plus-side an additional example of the Harrow II, K7020, arrived from Farnborough on the 18th. The following day, having got his Harrow, K6994, airborne, Burke had to land again after just 10 minutes because of fog.

Things became more complicated when the Air Ministry forbade the general transportation of fused mines. This meant a team of armourers would need to be based at Middle Wallop and suitably trained. To facilitate this a couple of experts, Owen and Hind from Detachment 02 of the RAE at Exeter, arrived to instruct on fusing duties. Meanwhile, there were ongoing discussions with the Aircraft Patents company about the design of bomb racks.

HOW THE LONG AERIAL MINE WORKED



CHRIS GIBSON

Three weeks into the experimental activity, Burke was joined by Flt Lt Dennis Hayley-Bell and Plt Off William Hoy to fly the Harrows. Burke was aloft for three hours on the evening of 21 October. Having climbed to 16,000ft over his base he flew to Worth Matravers and, at 20,000ft, proceeded to fly a patrol taking him out to sea for 20 miles prior to turning back to Worth. He repeated this for nearly two hours. Visibility was very good but no

enemy aircraft approached. As for Hayley-Bell, having just arrived on the unit he made a wheels-up landing in Battle P5248, so depriving the flight of a fast-moving target for practice. It is not clear whether the accident was due to mechanical failure or pilot error.

At Boscombe Down an experimental flight took place. This involved the dropping of six LAMs, sometimes called 'Pandoras' although this codename does not

appear in official documents, nor at operational level. Because of defects with the mines coming to light, that night's operational sortie was cancelled. More tests the next day had the result that further operational flights were put on hold until the mines had been modified.

Pressure to get some useful results was building, and on 26 October a third test in as many days was made with Mr Hind in attendance. Returning to Exeter, Hind took

with him several mines for further testing. Notwithstanding, that night the first practical test took place against the enemy. Such patrols were to be given the codename 'Mutton', presumably a phonetic reference to LAM.

Burke got Harrow K6994 airborne from Middle Wallop at 18.30 and would have spent the next 45 minutes reaching altitude before proceeding on his southerly patrol line under the direction of Worth Matravers. In his combat report Burke said, "At about 20:15 hours on 26/10/40, I was patrolling to and fro on a line running due south from Worth Matravers at 19,000 feet and had just arrived at the north end. I was given vector 160 degrees and about 10 minutes later I was ordered to port 90 degrees and 'fire.' About 10 seconds after pressing the release switch I felt and heard an explosion in the rear. Three more explosions occurred irregularly during the next half minute. When I estimated I had laid my curtain, I switched off the release switches and asked Worth for a homing vector". Despite the disconcerting explosions within the aircraft, Burke found the controls were responding, so he gently lost height and landed safely back at Middle Wallop three-quarters of an hour later.

The on-board blasts may well have spelt disaster, not only for the pilot and aeroplane but also the whole experimental project. An immediate examination of the aircraft, especially the bomb bays and their equipment, was made by an RAE team from Exeter. The report was ready the following day, and said:

"1. On the central carrier from the aft compartment the lower rear mine had failed to release. The two mines immediately above had released, but were prevented from falling clear of the aeroplane due to the one that had failed to release still being in position. The legs of these two mines had automatically been freed and had pulled out of the upper contents of the mines including the bombs and some of the wire. Apparently the bombs had exploded on being forced into contact with the framework of the aircraft.

"2. On the starboard carrier in the forward centre compartment the upper rear mine had failed to release. As this was one of the upper bank of mines, it had not prevented any of the other mines falling clear of the aeroplane, but had remained in position during the flight.

"3. The two mines that had failed to release were freed by hand, and the whole carrier system was tested by cocking all the release units and operating the automatic release gear. All the release units operated correctly except one. This was the one referred to in 2 above. This one was again individually checked and the defect was traced to a jam in the linkage between the E.M. [electromagnetic] Unit and the slip.

"4. The Unit referred to in 1 above functioned correctly in this test, and the conclusion drawn is that the E.M. Unit itself had failed in flight. No fault is attributable to the mines themselves."

What of the curtain of mines Burke had laid? Dr C. L. Smith and Plt Off Scott, who was sub-controller at Worth Matravers, visited Burke at Middle Wallop. They explained that of the two enemy aircraft approaching Worth, he had been sent to intercept the first. The curtain had given an excellent echo on the cathode tube, and they had been very satisfied with the interception.

“The on-board blasts may have spelt disaster for the whole project”

Only one aircraft was heard to pass over Worth. The plots of the aeroplane Burke had intercepted, obtained from D site of the CHL station at Worth, and those obtained by Worth's CH station ceased near the point of interception. The commanding officer of the CH radar station had seen a red glow in the sky. As a result, Smith submitted evidence both for and against the interception having been successful. No source has yet come to light suggesting Burke was credited with the destruction of an enemy aircraft on this night.

It was now time for the pilot's notes for the laying of a LAM screen to be written and these, together with the notes for the Douglas Boston — otherwise known as the DB-7 — were read and digested during the last few days of October as the weather was poor. The Boston was a step towards the intention of using the Douglas Havoc as a replacement for the Harrow.

No 420 Flight received a few more aircraft during November: Harrow K4493, Miles Mentor L4404 and Battle R7472. The month would see no operational sorties but, in the light of the accident on 26 October, a renewed testing programme was embarked on. In addition, work began on fitting out the DB-7 in order that it might supersede the Harrow. To this end, on 11 November Burke visited the Vickers works at Dartford to inspect drawings of the bomb racks and release mechanisms for the DB-7, but the next day it was over to Farnborough to pick up plywood bulkheads for fixing between the bomb compartments in Harrow K7020.

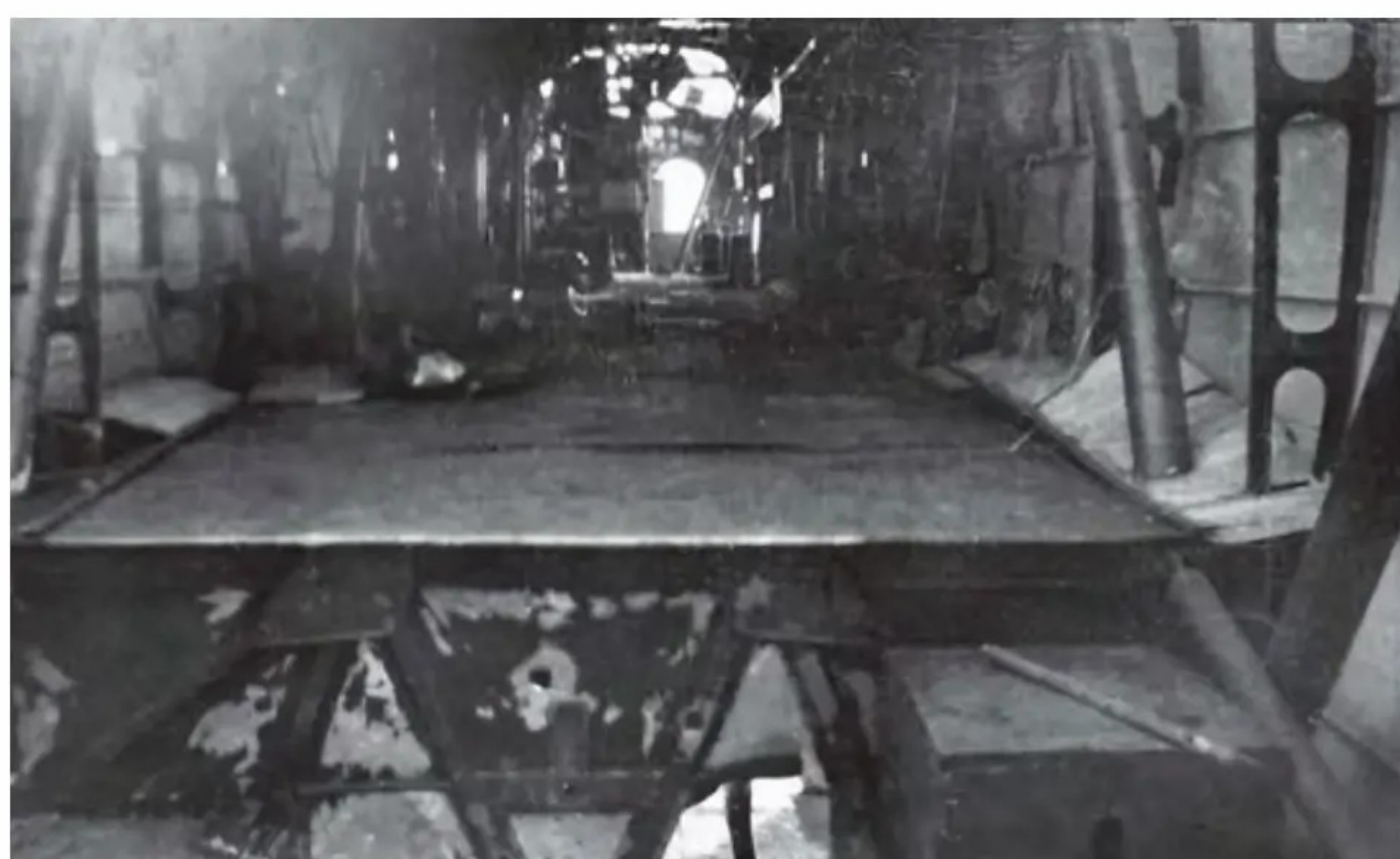
These bulkheads were fitted in two days and the bomb racks cocked and fired. All seemed to be working well, so K7020 was loaded with dummy mines at Farnborough. A test drop out at sea was made on the 14th with a Battle acting as camera-ship. Of the mines, 15 hung up, so the Harrow proceeded back to Farnborough for investigation. With the racks functioning again and a set of dummy mines loaded, it returned to Middle Wallop.

The aircraft — with a Blenheim and a camera-ship in attendance — performed another drop test on the 18th. This time 48 mines hung up but the remainder formed a good, level line. Harrow K7020 was returned to Farnborough where it was discovered an electrical fault within the bomb racks had prevented many of the mines from releasing.

Shortly afterwards, Burke and Gp Capt Rowley watched release trials of Aircraft Patents' rack designed for the DB-7. The release of the dummy mines was rapid, fairly even, and all dummies were disgorged without hang-ups. Meanwhile, Hayley-Bell — known as 'Jingles' — took Harrow K7020 up to 16,000ft from Farnborough in order to cock and fire the release mechanisms in the racks and ascertain whether they would function in freezing conditions, which they did.

There was an urgent need for a successful trial so the apparatus could be cleared and satisfy the Secretary of State's expressed wishes for getting into action against the enemy at the earliest possible date. The hope was to mount an operational flight on the night of 22 November.

It was late in the evening of the 21st when 500 modified bombs



arrived at Middle Wallop. They were not fitted with detonators and it wasn't possible to prepare them in time for the following day's trial. Previous to this, the No 420 Flight armourers had modified half a load, 80 bombs. It was therefore decided to carry out a trial with a load consisting of these bombs, together with 80 unmodified ones.

The thinking behind this was four-fold. There was the extreme urgency of the trial, even though a full load of modified bombs would not be available in so short a time. The weather was excellent and all the necessary arrangements had been

made. All containers had been so modified that the bombs could not detonate until clear of the aircraft. And tests had shown how 'flash-back' causing premature detonation only occurred in about one per cent of bombs.

After consultation between senior officers, boffins and Pat Burke, it was decided to accept the slight risk of premature detonation. They were comforted by the knowledge that the recently modified bombs could no longer detonate within the aircraft, as had occurred on 26 October.

A full test of the electrical release gear took place in the morning, after

which the toil of loading the 160 mines onto the carriers in Harrow K7020 began. This was a long job and the unit's armourers had no previous experience in fitting the containers to the modified carriers.

The Harrow, flown by Hayley-Bell — together with a photographic aeroplane, escorting Spitfires and Harrow K7005 with Burke as pilot and observers aboard — set out at 14.15, but had to return to base as there were enemy aircraft reported in the vicinity. A second attempt was made at 16.30 without the photo-ship, as the light had deteriorated. The curtain of mines was laid at

ABOVE: Harrow K6994 was lucky to escape on 26 October 1940. Illustrated here are the port-side damage, how the blasts affected the internals — a hung-up mine on a lower rack prevented two mines above from falling clear, resulting in premature detonation — and the bomb bay with a hung-up mine still in place on the starboard carrier, in the forward centre, upper rear. JACK LISTER

PROJECTS Long aerial mine



TOP: Known as 'Jingles', Dennis Hayley-Bell had been promoted to squadron leader and was flying Beaufighters with No 255 Squadron when this image was taken in 1942.

M. HAYLEY-BELL VIA ANDREW THOMAS

ABOVE: Flt Lt Pat Burke was key to testing how a long aerial mine curtain should be laid and its introduction into operational use. This picture was taken at that time, with Burke wearing his recently awarded AFC.

VIA MICHAEL BURKE

17.00 from about 5,000ft. They left the aircraft as intended, doing so regularly, evenly and forming an impressive-looking curtain.

After several had been released, there was a premature detonation which appeared to take place some distance behind the Harrow. Then came a second, rather closer, and a third quite a way away. A considerable number of mines were dropped between each premature detonation. Although the curtain as a whole was regular, 15 parachutes were considerably above the remainder and two below.

The pilot reported how he had felt his tail being lifted by a premature detonation, and that after the third such instance he switched off the laying gear. An observer in the Harrow said he had noticed a small tear in the fabric. The slipstream got

into this tear and, on the way home, tore off much of the fabric from one side of the fuselage. One mine on the bottom-layer rack was found to have hung up in a similar way to that which caused the accident on 26 October. This time, however, because of the modification to the rack and aircraft, the apparatus remained in a safe condition. Harrow K7020 went to Farnborough for repair.

Using recently adapted Harrow K6993, a further drop test took place a few days later with modified mines. This time the pilot was Burke and he had a number of VIPs on board. Harrow K7005 went along as the observing aircraft, piloted by Wg Cdr J. W. Homer with more VIPs as passengers. Two mines exploded prematurely and damaged the laying aircraft slightly, but it landed safely at Middle Wallop. Once again, a gathering of experts, together with Burke, discussed possible reasons for the accident.

Early in December 1940, Homer was posted from the Special Duties List at RAE

Farnborough to command No 420 Flight. Harrow K7020 took off from Middle Wallop on the 5th for a drop test using concrete bombs. The racks had been modified so

the dummy weapons were disgorged from the Harrow at brief time intervals starting from the rear and working forward. The curtain was considered to be satisfactory, though there were about 20 high-flying parachutes.

At this juncture Flt Lt Pat Burke's work was recognised with the recommendation of a formal award. It read, "The above mentioned officer has shown outstanding devotion to duty in carrying out a number of experimental flights in connection with mine laying at great personal risk. Despite the fact that his aircraft sustained damage by premature detonation of mines on two occasions, he retained his enthusiasm and confidence in the ultimate success of this defensive weapon". Air Marshal Sholto Douglas, by now commander-in-chief of Fighter Command, endorsed this on 6 December: "I strongly support this recommendation. This officer has displayed most conspicuous gallantry in continuing

these experiments in the face of great personal risk". Burke's receipt of the Air Force Cross was gazetted on 24 September 1941.

No 420 Flight became No 93 Squadron on 7 December 1940. It was proposed that the unit would consist of two Havoc flights and one of Wellingtons. The first Wellington was duly collected from Farnborough for handling purposes, and soon afterwards Homer was accompanied by Burke and Hayley-Bell to attend a conference there regarding mine-laying and mine-towing. Homer brought back Boston AW411, loaned by the RAE for handling practice.

There were no premature detonations when a further drop test with cement-filled bombs was made on the 11th. Sir Henry Tizard, chair of the Committee for the Scientific Survey of Air Defence, watched from an escorting aircraft. A final drop test four days later was considered successful. Now the stores were judged more secure, 'Mutton'

operations were to start as soon as possible.

Burke took Harrow K6993 up in the early evenings of 21-22 December. He hoped the former would be a 'Mutton' sortie but had to return

owing to bad weather. On the latter, patrolling the Worth Matravers area, Burke 'fired' his load and claimed an enemy aircraft destroyed. This patrol was made between 17.35 and 20.05 with the destruction of the aircraft being timed at 19.07.

It is worth looking at the combat report relating to this action: "I was patrolling Worth area at 19,000 feet. At 19:02 hours I was given a Vector 190 degrees and about 5 minutes later 'starboard 90 degrees and fire.' About 30 seconds after firing I saw a reddish flash and about 1½ mins later four white flashes in succession. After laying curtain I turned port and about 3 mins after firing I saw two more flashes low down. I returned to base."

Burke subsequently learned that on the CHL tube two enemy aircraft were approaching Worth from 190°, one two miles astern of the other. The first was intercepted, the echo of the curtain being seen across its track. Its echo disappeared into that of the curtain. Only one aircraft echo

“The pilot felt his tail being lifted by a premature detonation”

passed through the curtain, which must have been the second aircraft trailing the first.

Other military observers gave a similar account to Burke's. Fg Off Bruce, watching from the cliff edge with field glasses, and Sgt Peters on the roof of the CHL station saw a flash at 19.08, two at 19.09 and, a minute later, two or three. Peters said he saw a glow of one to one-and-a-half seconds. He was convinced this in no way resembled the flash of the exploding bombs. The operations record book states the enemy aircraft was claimed and confirmed as destroyed. No other source this author has found mentions a kill.

Burke was airborne again on the following two evenings and on the 29th, each time in K6993 but with little to report. The mission on the 24th was aborted when the Harrow's generator failed. The squadron was growing, and between 22 December and the end of the year, 260 airmen of many ranks and varied trades joined its strength. At the same time as the test drops and 'Mutton' operations were going on, preparations for getting the DB-7 — now being referred to as the Boston — ready for the role of laying mines were progressing. Using this type, the 26th saw a 50-minute formation practice with Homer, Burke and Hayley-Bell as pilots. Before the close of the month, the two flight lieutenants and a couple of groundcrew visited RAF Burtonwood to inspect the equipment of the operational Boston.

Flt Lt H. G. Goddard arrived on New Year's Day 1941 to take up his duties as Wellington flight commander. These aircraft were to be used for towing a mine barrage. But activity was lacking for the whole unit. Availability of Luftwaffe aircraft for bombing operations as at 4 January 1941 was down to 551 machines, a mere 41 per cent of the bomber strength of Luftflotten 2 and 3, the German air fleets based in northern France and the Low Countries. Accidents, overhauls and repairs were behind this low figure and reflected the pace of the recent month's operations. This, combined with the bad weather experienced during January and February, meant the reduced number of infiltrations across the south coast curtailed any laying of LAM curtains during 'Mutton' patrols.

Burke flew three such patrols in the first few days of January, and a number of trips in Bostons, followed



by some deserved leave. During the remainder of the month, Hayley-Bell completed three patrols and Hoy five. Several of these lasted for more than three hours.

Hayley-Bell later spoke to Alfred Price about one 'Mutton' operation which might have raised eyebrows but didn't. "If one was very lucky, one might see a flash to indicate that an enemy aircraft had hit one of the wires and dragged down the bomb. But usually there was nothing to be seen. The mines were always released some way out to sea, because any coming down on land might cause damage. During one of the early operations the ground controller failed to make sufficient allowance for the wind, with the result that several mines landed near Bournemouth and the long wires shorted out overhead power lines in the area. Fortunately, everyone blamed the resultant power cuts on the Germans, so we escaped any awkward questions."

Just one 'Mutton' patrol took place in February, this on the 1st when Hoy was up for two hours in K7020 but without an opportunity to release his mines. The bad weather thereafter prevented both training and operational sorties. A suitable

location for a ground-controlled interception (GCI) station to work with No 93 Squadron was being sought, one which had been put in place at Wherwell having been found unsuitable and closed. An alternative site at Sturminster Marshall was taken over and proved satisfactory.

Better weather in March allowed 93 to resume activities, which included the Wellingtons of 'C' Flight streaming towed barrages at night and making a live drop over Porton range. 'Mutton' flights occurred on four consecutive nights from the 11th to the 14th, all in the repaired Harrow K6994. Pilots involved were Hoy, Lloyd and Hayley-Bell.

Climbing to 17,000ft on the 13th, Hayley-Bell was instructed to a point about four miles ahead of an incoming bomber and 3,000ft above. At 20.50, 12 miles out from Swanage he was ordered to start laying his curtain of mines. Soon afterwards there was a small detonation below him and then a bigger one, violent enough to shake the Harrow. Radar operators at Sopley reckoned the intended target had missed the curtain but that another bomber in the area had triggered a mine. Hayley-Bell was allowed one enemy

ABOVE: This Harrow was given shark's teeth nose art. Some sources identify it as K6994, but this is unsubstantiated.
VIA STEVE RICHARDS

NO 420 FLIGHT/NO 93 SQUADRON AIRCRAFT

Handley Page Harrow II	K6993, K6994, K7005, K7020
Douglas Boston/Havoc I	AE460, AE469, AW392, AW406, AW411, AX913, AX914, AX915, AX925, AX930, BB892, BB894, BB895, BB896, BB901, BB912, BB913, BD110, BD113, BD117, BD118, BD122, BD123, BD913, BJ460, BJ470, BJ473, BJ488, BJ490, BJ493, BJ901, BJ916, BK883, BT465, BT615, DG554
Vickers Wellington Ic	R1099, R1245, R1370, T2823, T2824, T2906, T2908
Fairey Battle I	L5049, P5248, R7472
Miles Mentor	L4404
de Havilland Tiger Moth II	R4947

RIGHT: While certain images purport to show Havoc BT465, which achieved several long aerial mine victories with No 93 Squadron, this one actually does. It carries the codes HN-A and is named *Aphrodite*.

KEY COLLECTION



aircraft destroyed although, as with other No 93 Squadron 'Mutton' claims, no tangible evidence would come to light.

Lloyd's flight on the 14th, which lasted for two-and-a-half hours, saw him releasing his mines but with no result. He came under fire from the Portland anti-aircraft guns. This was to be the last recorded patrol made by the obsolescent Harrow. Group headquarters put the Wellingtons and their towed barrage on standby to cover the period from 22-31 March but they weren't destined to be called upon.

Working up on the Havoc I was henceforth to be centre-stage. Homer took a Havoc to Northolt to perform a demonstration before the Prime Minister, Winston Churchill. Poor weather in the locality prevented the flight, so Churchill was shown a film of a test instead.

As part of routine flying, Hoy and Plt Off Porter flew a Havoc on a co-operation exercise with the guns at Porton. One of the Douglas machines was damaged on the last day of the month in a forced landing, Hayley-Bell having been conducting a drop timing test when the port escape hatch fell open and jammed the undercarriage. In a second Havoc, Hoy flew alongside to give support over the radio. Hayley-Bell attempted to jettison the load but due to a fault in the release mechanism he only got four mines

away over a 90-minute period. He made a wheels-up landing at Middle Wallop with the rest of the mines still on board.

More Havoc deliveries were made in April and, with increased enemy activity, there were further opportunities to fly 'Mutton' operations. On the night of the 9th and 10th, while working under the control of Sturminster Marshall, Burke — flying BT465 — 'fired' and a claim for one enemy aircraft

“Pat Burke's personal diary succinctly states, 'got one'”

destroyed was made. Burke's own logbook does not mention this but his personal diary succinctly states, "got one". Hayley-Bell did the same the following night in BB894. During an attack against Plymouth on 29 April, Flt Lt MacLannahan and fellow crewman Sgt Huntley flying BT465 fired LAMs and claimed one enemy aircraft destroyed.

On the same day as Wg Cdr M. B. Hamilton took over from Homer, 23 April 1941, the two Havoc flights were formally declared

operational for night interception duties and 'C' Flight was taken to form the nucleus of the Fighter Experimental Establishment (FEE). Its work with the towed barrage had not gone well, the 120mph the Wellingtons could muster when towing being inadequate, and it appears the strain put on their engines had caused serviceability issues. The FEE was also to base its aircraft at Middle Wallop, though the unit — at least in this guise — only lasted until the end of July. After this it amalgamated with the Blind Landing Detachment at RAE Farnborough and later the Special Duties Flight from Christchurch to form the flying detachment of the Telecommunications Research Establishment.

The newly operational squadron flew from Middle Wallop for a few weeks, with detachments operating at different times from Coltishall, Hibaldstow and Exeter. Between 11 March and 29 July 1941, No 93 Squadron notched up 112 mine-laying sorties. Of these, 59 interceptions were attempted but only 16 were worthy of laying a curtain. Finally, with the scarcity of German night raiders, the decision was taken to discontinue the use of aerial mines. This resulted in No 93 Squadron disbanding on 6 December 1941, and the end of a notably specialised — and hazardous — capability.

Thanks to Colin Barrows and Michael Burke.

A



ARRIVALS



FLIGHT NO.

E G N 3 0 8

DESTINATION

L O N D O N

STATUS

D E L A Y E D

A F X 0 0 1

A I R F I X

O N T I M E

C L 2 1 1

N E W Y O R K

C A N C E L L E D

J P I 4 7 5

T O K Y O

D E L A Y E D



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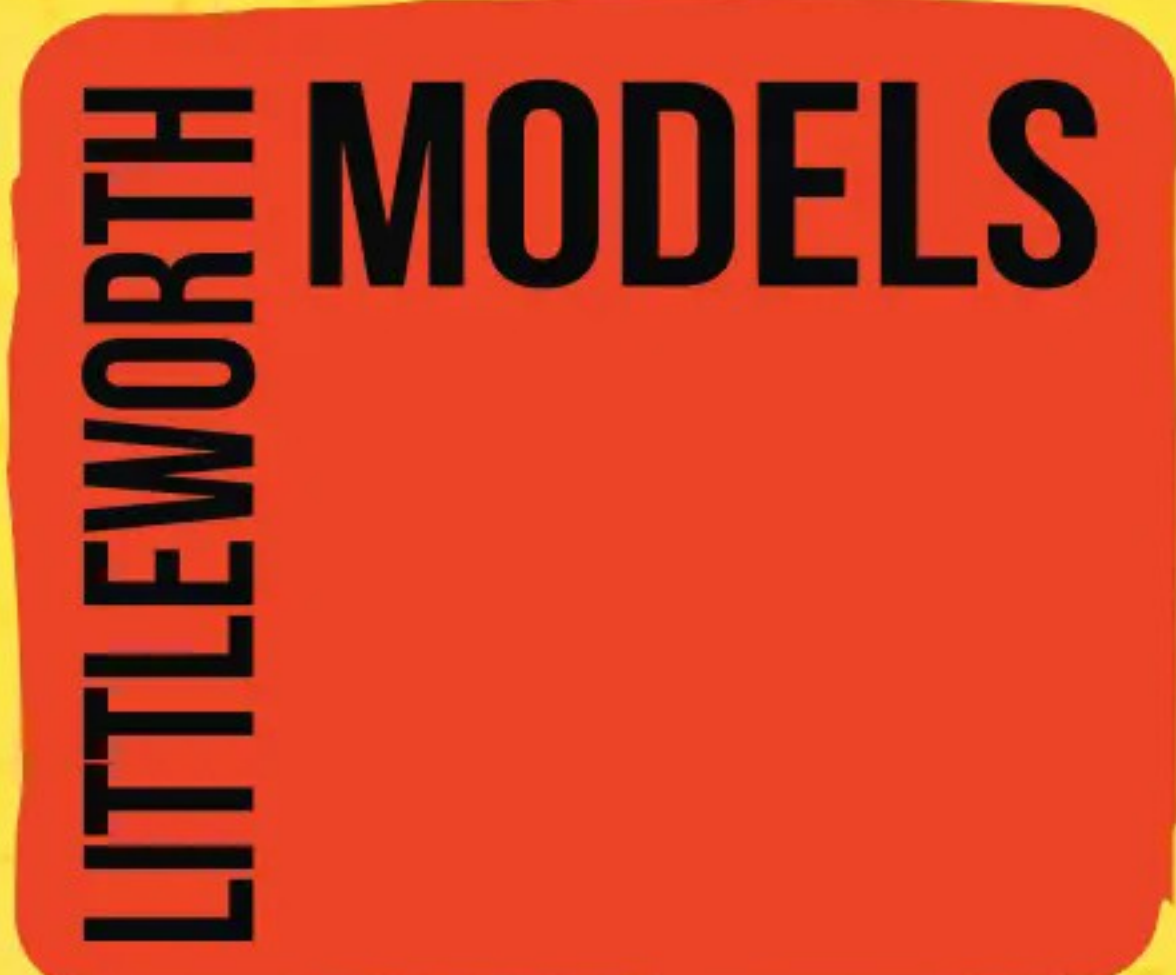
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FIGHTING FALCON



A Spanish Civil War veteran, the Miles Falcon operated by the Fundación Infante de Orleans is a unique piece of flying history — but its full background is a tangled tale indeed **WORDS:** BEN DUNNELL



Perhaps you've heard of the Circus Krone, one of the most historic and important in Europe, with its own colourful building in central Munich. It grew out of the founder's menagerie, and even now a motley array of creatures can be seen in the regular shows. For decades it has been a byword for variety, and thus it was, during the Spanish Civil War, that the moniker came to be unofficially applied to a flying squadron on the Republican side using little more than whichever aeroplanes it could lay its hands on.

The so-called 'Circo Krone' was the brainchild of the provisional Basque Country, or Euskadi, government led from 1936 by José Antonio Aguirre. Unable to obtain equipment via regular means, it acquired its hardware from a multitude of suppliers. The resulting outfit had its roots in the purchase of three light aeroplanes sourced in Britain and picked up from Paris. Among them was a Miles Falcon Six, which — among other roles — came to serve as one of history's most unlikely bombers. This machine now flies on with Spain's Fundación Infante de Orleans, the sole surviving airworthy aircraft from the civil war. Or does it? The full story, it turns out, is somewhat more complicated.

That's to put it mildly, because even attempting to unravel the background of this flying Falcon involves two different airframes and a host of uncertainties. Pieces of their heritage had been lost in the mists of time, and even the most diligent research could only go so far towards a concrete resolution of its roots — or so it was thought for many years. One of the elements *not* open to question is that the machine flying with the FIO today is a Republican civil war veteran. So, prepare for a decidedly convoluted tale.

Let's start with constructor's number 197, an M.3A Falcon Major. According to the doyen of Miles historians, Peter Amos, its certificate of airworthiness was issued on 22 June 1935, and Spanish ferry registration EC-W48 issued for the delivery flight to Spain. There the blue-and-silver machine became EC-BDD, probably on 16 July, its owner being Rafael de Mazarredo y Trénor who managed the



LEFT:
The very beautiful, and superbly restored, Miles Falcon EC-ACB flying out of Cuatro Vientos earlier in 2024.

LUIGINO CALIARO

RIGHT:
Falcon Six G-ADLS
(c/n 231) in 1935,
prior to its delivery
to Spain. Noteworthy
here are the 'tail'
to the rear window
frame and the larger
fin and rudder,
together with the
extended rear lower
fuselage due to the
bigger engine.

VIA PETER AMOS



flying school at the Valencia Aero Club. When the civil war broke out in July 1936 between the loyalist Republicans and the opposing Nationalists, the Falcon Major was put at the disposal of the Republican air arm, the Fuerzas Aéreas de la República Española. Just about a month later, reportedly on 23 August, it was shot down near Teruel in eastern Spain.

Its life and times didn't end there, but now the other aircraft bound up in this saga needs introducing. This was an M.3C Falcon Six — a version using a 200hp DH Gipsy Six engine instead of the Falcon Major's 130hp Gipsy Major — with constructor's number 231. Originally registered G-ADLS on 15 July 1935, its initial owner was Samuel Harris, whose company Croydon Airways took delivery on 5 September. The Falcon Six was optimised for air racing, and Harris and Laurence Lipton immediately flew this new example in the 1935 King's Cup, placing fifth. G-ADLS changed hands in June 1936, purchased by Royal Auxiliary Air Force pilot Andrew Farquhar and kept at Abbotsinch. It didn't stay with him for long, though, as on 9 August there occurred the sale that took this Falcon to Spain.

This was via an organisation called the Union Founders Trust, which covertly procured arms for the Republicans. The very same day, it flew to Paris. A senior Republican delegation there took delivery of three aircraft. Alongside the Falcon Six was another Miles product, the Hawk Major G-ADAS, and a General Aircraft Monospar ST-25 Jubilee. Which of the pilots involved conducted the delivery flight is

“The Falcon Six was fitted with improvised bomb racks”

not known, but G-ADLS arrived in Bilbao on 14 August. Soon it was fitted with improvised bomb racks and embarked on operations from the airstrip at Lamiako, specially established by the Basque government as part of its efforts to take on the Nationalist rebels.

Many accounts exist of what the Falcon Six did in Republican

service, though they rarely agree in the detail. One example concerns a sortie on 2 December 1936, when it was in the hands of José María Yanguas Yañez with Luis Otaño as observer and bomb aimer. It and either a DH Dragon Rapide or a Farman F231 — descriptions differ — were escorted by Soviet-flown Polikarpov I-15 'Chato' biplane fighters of the Republican air force on a raid to José Martínez Aragón airfield in Vitoria, or Nationalist forces on the Isuskiza mountain, the road and railway linking Villarreal and Vitoria, and artillery positions in Urbina and Gojain. However, a lack of suitable targets saw the Miles's bombs being dropped elsewhere, possibly on some trucks in nearby Elorriaga.

Another who flew it is said to have been a Briton, Walter Scott Coates. He was part of a small group of mercenary pilots which also, briefly, included his fellow countryman Sydney Holland and a quartet of Americans. Coates is often cited as having been at the Falcon Six's controls when it was set upon by Heinkel He 51 B fighters of the Legion Condor. As described by Gerald Howson in his book *Aircraft of the Spanish Civil War* (Putnam, 1990), when the Germans "saw the clean silhouette of a low-wing cantilever monoplane appear on the horizon, they took it for a new model fighter". They broke off the fight, though the presence of I-15 escorts might have had as much to do with it as the shape of the Miles.

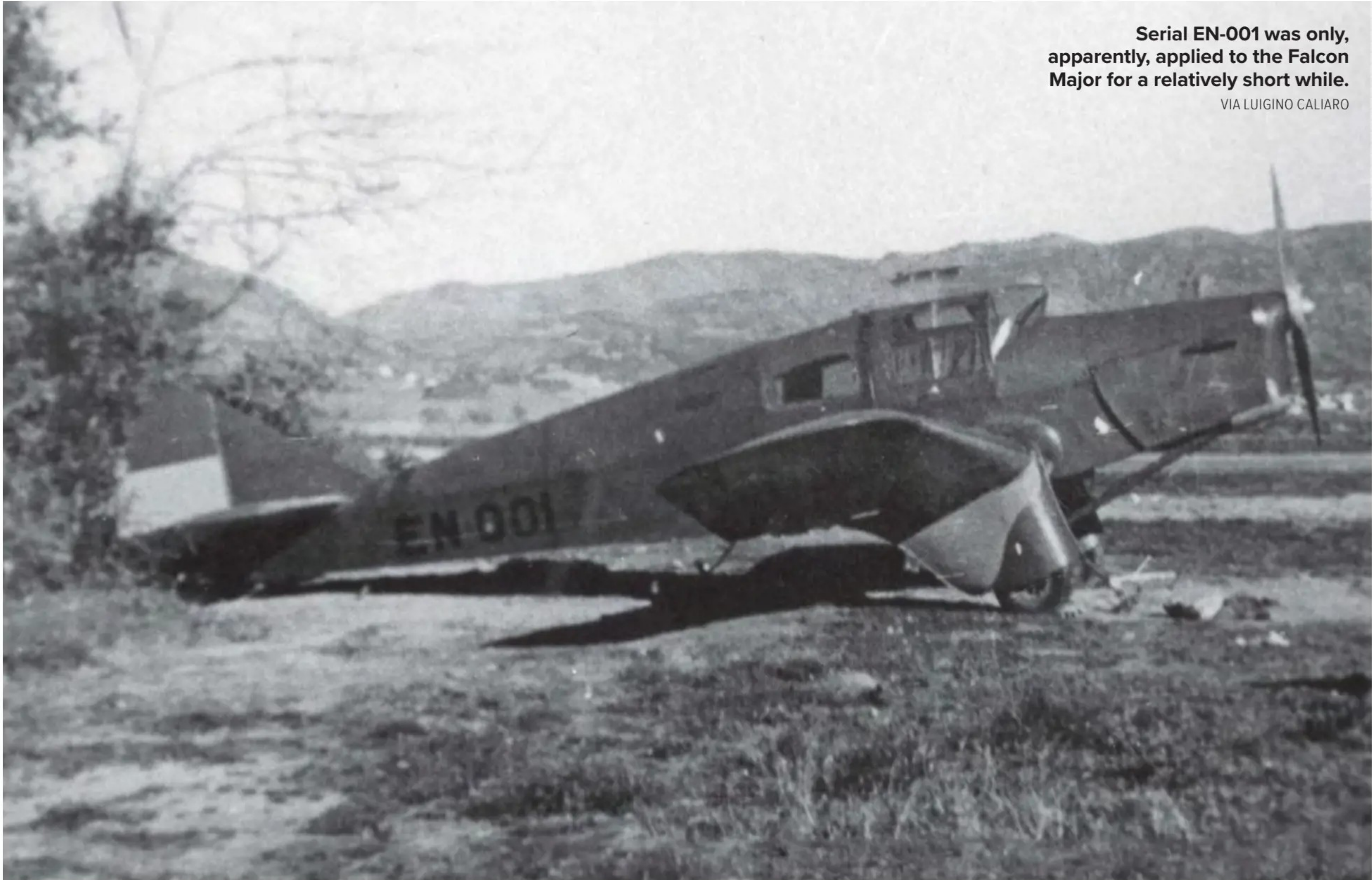
Deliveries of further aircraft to the 'Circo Krone' seem to have relegated the Falcon Six to liaison duties following the fight for Villarreal, but it remained on strength until the 'War in the



RIGHT:
Falcon Major c/n
197 as EN-001 at Los
Alcázares between
April 1939 and
February 1940.

VIA LUIGINO CALIARO





Serial EN-001 was only, apparently, applied to the Falcon Major for a relatively short while.
VIA LUIGINO CALIARO



An enlarged non-standard rudder and fin had disfigured EC-ACB, here bearing the name *Virgen de Loreto*, by the time it was pictured at Zaragoza in 1975. VIA PETER AMOS



EC-ACB *Ana Mary* post-1947, when a change in regulations altered its registration from its previous EC-CAO.
VIA PETER AMOS



The unrestored EC-ACB at Wycombe Air Park on 18 September 1993. BERNARD MARTIN



Arriving at Personal Plane Services' facility on 7 June 1995 is the restored centre section. BERNARD MARTIN

THE FALCON FLYER'S BETRAYAL

The name of José María Yanguas Yañez crops up often in the story of the Spanish Falcon Six. He was involved in its acquisition, and he flew it operationally during the civil war. But it's with more notorious matters that the man from Bustio in northern Spain is most often connected.

A civilian pilot, Yanguas was part of the party that picked up the Falcon Six, Hawk Major and Monospar from Paris in August 1936.

One of the others was Julio Alegría, who seemingly shared quite a bit of the Falcon's subsequent wartime flying with him. Then Alegría deserted to the Nationalist cause, and Yanguas assumed greater prominence within it. He became a highly trusted figure on the part of the Basque — or Euskadi — government, many members of which were themselves flown by him.

As the city of Bilbao came under increasing Nationalist attack in April 1937, the priest of the parish of Begoña decided he must take action to safeguard the image of Our Lady of Begoña — an apparition of the Virgin Mary — and other objects of worship. Evacuating them to Toulouse was felt the best option. With the religious artefacts would go a collection of valuable jewels and 180,000 Francs from the Basque government's reserves. Yanguas was chosen to perform the move and deposit the items in a bank. His orders were to do so under the names of five representatives of the Basque administration. The bank manager, however, said he could only name one individual. Yanguas chose himself.

In purchasing aircraft for Republican use, Yanguas had also channeled money to his own accounts. Among them was a Caudron C448 Goéland, F-AOMX, for which one account says he was given 550,000 Francs, but paid some 70,000 less. This twin-engined light transport entered service with Air Pyrénées, a Basque government company, and Yanguas flew it often.

One occasion was on 21 June 1937, two days after Bilbao had fallen to the Nationalists and the Basque seat of government was transferred to Santoña. Yanguas was detailed to fly health minister Alfredo Espinosa Oribe there from Toulouse. Other passengers included senior artillery officer José Aguirre. Just over an hour-and-a-quarter into the journey, the Caudron landed not at its planned destination, but on a beach at Zarautz. The northern town had already fallen to Nationalist-supporting Falangist forces. Yanguas claimed engine trouble, but the diversion had been planned in collaboration with the local authorities. Among other things, bathing machines were removed from the sand and Nationalist naval vessels in the vicinity ordered not to open fire.

Oribe and Aguirre were handed over to the Nationalists and subsequently executed. The three other people on board, including the flight engineer, were briefly taken prisoner and then released. With Joaquín Goyoaga, a prominent Francoist, Yanguas dashed back to Toulouse by car and recovered the religious treasures, the jewels and the 180,000 Francs he'd deposited in the bank. Returning to Spain, the sacred artefacts were passed via the border police to Gen Fidel Dávila Arrondo, a staunch Franco loyalist, and were returned to the church in Bilbao. Yanguas — who always maintained his innocence — would appear to have retained his other ill-gotten gains.



José María Yanguas Yañez defected from the Republican side in 1937.
BIBLIOTECA NACIONAL DE ESPAÑA



The Falcon has been part of the FIO fleet since 1997. LUIGINO CALIARO

North' ended in the face of an unstoppable Nationalist advance. On 20 October 1937, a Polikarpov I-16 and two I-15s, a Potez 25 and the Farman fled into France. So did a Miles aircraft, but was it the Falcon Six or, as has also been stated, the Hawk? The former appears to be the most likely, since it ended up back in Nationalist-held Spain via a stay in France and was put back into military service. In *Aircraft of the Spanish Civil War*, Gerald Howson claims that in an attempt to avoid capture by the Nationalists, Falcon Six c/n 231 was flown to France only to come to grief in a forced landing at Grimaud near St Tropez on 7 November 1937.

The Nationalist air arm, the Aviación Nacional, took on the former G-ADLS as serial EN-002. It became resident at Los Alcázares in Murcia, serving there with the

observers' school. Following the reported shoot-down near Teruel and its capture by the Nationalists, who flew it as 30-168, the repaired EC-BDD (c/n 197) also spent time stationed at Los Alcázares, now with

“What happened to muddle the pair cannot be ascertained”

serial EN-001. Once the civil war was over, with the surrender of the remaining Republican forces on 1 April 1939, they were subsumed into the new Spanish Air Force, the Ejército del Aire. More than one

Compared to the 1935 photo of G-ADLS, the Falcon Major-style stern post and forward position of the tailwheel on EC-ACB are different. LUIGINO CALIARO



source says the Falcon Major (c/n 197) had the serial 30-117 and the Falcon Six (c/n 231) serial 30-168 by February 1940, when they were stationed in Valencia.

Precisely what happened to muddle the pair so comprehensively cannot be ascertained. The FIO's own history says they both ended up during 1944 in the Maestranza (depot) at Albacete, where "a surprising mutation occurred". If the aircraft that left the depot "really was the Falcon Major", it continues, this machine was now fitted with the Gipsy Six engine, serial number 6887, that had previously been in the Falcon Six. "If there was no change of engine", the account remarks, "there must have been a change of identity..."

The research by Peter Amos supports this. He says, however, ➤

THE ITALIAN JOB

Another Miles enthusiast, David Elliott, adds a further element to the story of Falcon Major c/n 197. He says it was captured during the Catalan campaign in late 1938 or early '39 by the staff of the XXII Gruppo Caccia 'Asso di Bastoni', a group of Italian mercenaries flying for the Nationalist rebels. Adding the group emblem and the fictitious Italian civil registration 'I-BELA' on the fuselage sides, together with a crudely applied civilian colour scheme, may have been a way of easing the passage of this piece of 'war booty' to Italy. However, David says this never happened, and it stayed in Spain. The accompanying photo of it at León shows an unusually long and angled exhaust pipe, very much like that on c/n 197 as EN-001 at Los Alcázares — one of just two Falcon Majors David has seen with such an arrangement — while the paint job closely resembles that of the same aircraft when it was EC-ACB when in civilian hands.



VIA DAVID ELLIOTT



Digital renderings of the planned new FIO hangar at Getafe, inside and out. FIO

FIO FUTURE

Open since March 1911, Cuatro Vientos in Madrid is Spain's oldest operational airfield. As such, it's been an appropriate centre of operations for the Fundación Infante de Orleans, the country's leading flying museum. This non-profit organisation was officially formed by a group of enthusiastic pilots in 1989 and is devoted to the preservation, restoration and promotion of Spanish aviation history, with a superb collection of vintage aeroplanes numbering more than 40 airframes and covering a time-span in excess of 70 years. Demonstrated in monthly flying days at Cuatro Vientos, the airworthy machines are looked after by the FIO's own maintenance workshop.

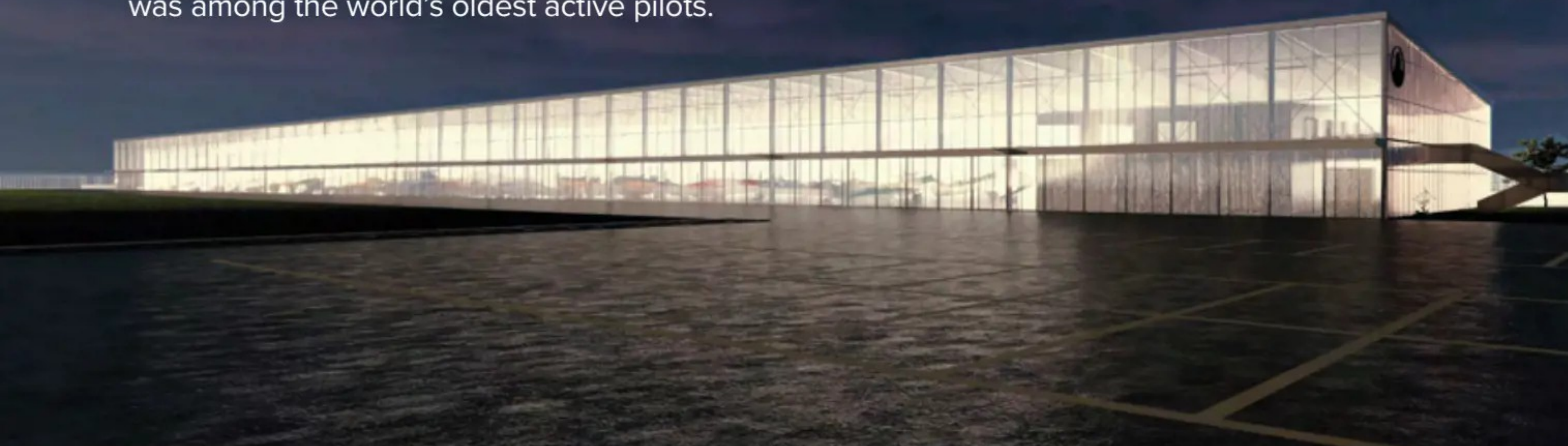
The foundation is named in honour of Don Alfonso de Orleans y Borbon (1886-1975), a famous aeronautical pioneer. He was the first Spanish military aviator, graduating in 1910, and flew well into his 88 years, amassing more than 6,000 flying hours. By the end of his career he was among the world's oldest active pilots.



Now the FIO is looking forward to a major transformation. Its collection is set to move to new facilities at Getafe, south of Madrid, thanks not least to the financial support of Airbus and to the Ejército del Aire y del Espacio (Spanish Air and Space Force). This will allow the fleet to use Getafe's larger and longer runway, and afford greater operational flexibility since it is a military airfield and not surrounded, as Cuatro Vientos is, by houses.

Hangar floor space will total around 6,000 square metres, including the publicly accessible museum, accompanying maintenance and restoration facilities, offices and so forth. The monthly flying events will continue, with significant ramp space in front of the main building. Construction work is set to begin during 2025, in time for a full opening in 2026.

For more details, visit www.fio.es



he can “now confirm categorically” that the aircraft still flying was originally a Gipsy Major-powered Falcon Major later modified in Spain to take a Gipsy Six, “without any apparent concern at the time for the airframe's structural integrity!”

Records are incomplete and, to judge from all the varying versions, faintly bewildering. Witness how the FIO recounts that the Falcon Major reappeared on the air force inventory in 1945. Re-serialised post-civil war as L5-168, the Spanish civil registration was cancelled in a census on 12 November 1940. If it did become L5-168, it was understood to have been damaged in an accident at Jerez de la Frontera on 18 September 1947, which put paid to its flying days forever. It was then acquired without an engine by the Huesca Aero Club in 1952 and the registration EC-AGY reserved, but reports say it was not repaired and scrapped in 1961.



A Spanish friend of Peter Amos was able, through examining the official civil register, to verify the modification of the Falcon Major with a Gipsy Six. It thereby became what he calls, “almost” a Miles Falcon Six, and was also fitted at some time with a very poorly made, but a slightly more ‘conventional-looking’ windscreen. An enlarged fin and rudder were also fitted due to the increase in horsepower of the DH Gipsy Six engine. Another photo shows a small ‘fin’ fitted on the starboard tailplane”. By that point, the machine was registered EC-ACB, its official documentation giving the constructor's number as 197 — that of the Falcon Major.

On retirement by its long-time owner CETFA (Compañía Española de Trabajos Fotogramétricos Aéreos), a firm specialising in photogrammetry, the Falcon was sold into private hands. Ending up in storage at Zaragoza Airport, one prospective purchaser reported back in 1986 that the airframe's condition was generally good. However, when the group that came together to found the FIO purchased the now dismantled Falcon and examined it in depth, the decision was taken to pay for a full, professional rebuild, largely funded by the Banesto Foundation.



To that end, EC-ACB was transported to Personal Plane Services at Wycombe Air Park, where it arrived in September 1993. Shortly afterwards, Peter Amos was invited to inspect it by PPS's chief engineer. He recalled that the fuselage had been completely stripped of paint back to the plywood by the Spaniards, but that blue paint was still evident between the joints. However, this didn't help to confirm its identity as c/n 231 had also been painted blue. The c/n 197 was "stamped on a small, home-made zinc plate nailed to the inside of the cabin wall". A new centre-section had to be built by Tim Moore of Skysport Engineering at Hatch, Bedfordshire, as the original had become soaked in oil — this was later acquired from Tim by David Elliott of The Miles Aircraft Collection. The final proof that EC-ACB really is c/n 197 came when it was noticed that the

rear window frames were different, lacking the small 'tail' evident on the photograph of G-ADLS. The Gipsy Six engine, meanwhile, was overhauled in Argentina.

With everything finally assembled in the PPS facility, well-known

“The Falcon is among Spain's most important vintage aircraft”

display pilot Jonathon Whaley took the Falcon for its maiden post-restoration flight on 15 May 1997. FIO president Carlos Valle and foundation member Juan Crespo carried out a short familiarisation prior to embarking on EC-ACB's

delivery flight to Cuatro Vientos, Madrid on 10 June. Unsurprisingly, this was not the work of a moment, poor weather and a troublesome powerplant hindering progress. But, proceeding via Le Touquet, Caen, La Rochelle, Biarritz and Pamplona, they made it.

Preserved in airworthy condition by the FIO and demonstrated at Cuatro Vientos during its monthly flying days, the Falcon — historical contradictions put to one side — counts among Spain's most important active vintage aircraft. Even with a Polikarpov I-16 in the foundation's fleet, bedecked in Republican markings and representing the type that best took the fight to Franco's Nationalists, the almost unassuming Falcon occupies a unique position as a survivor of its time.

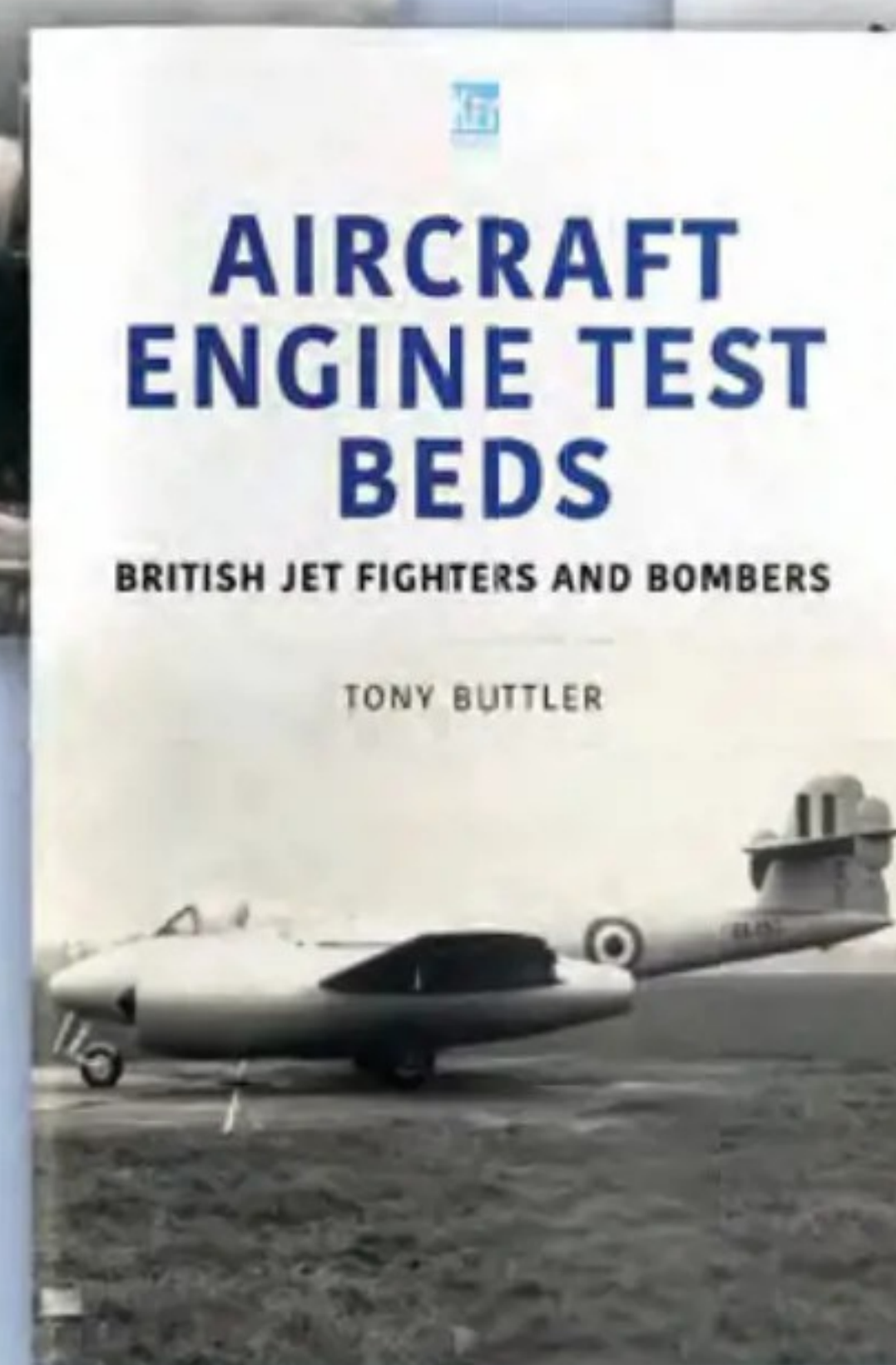
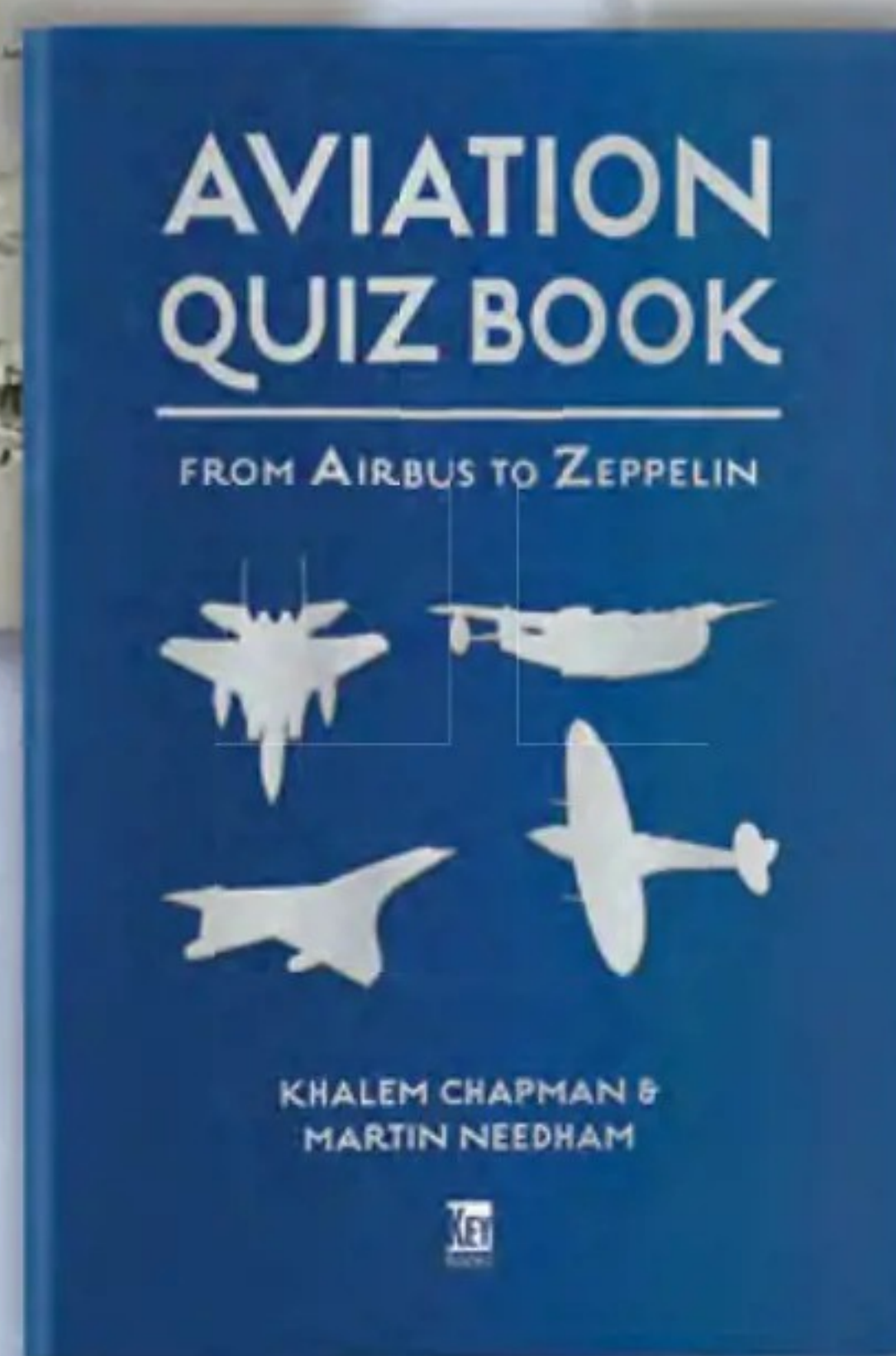
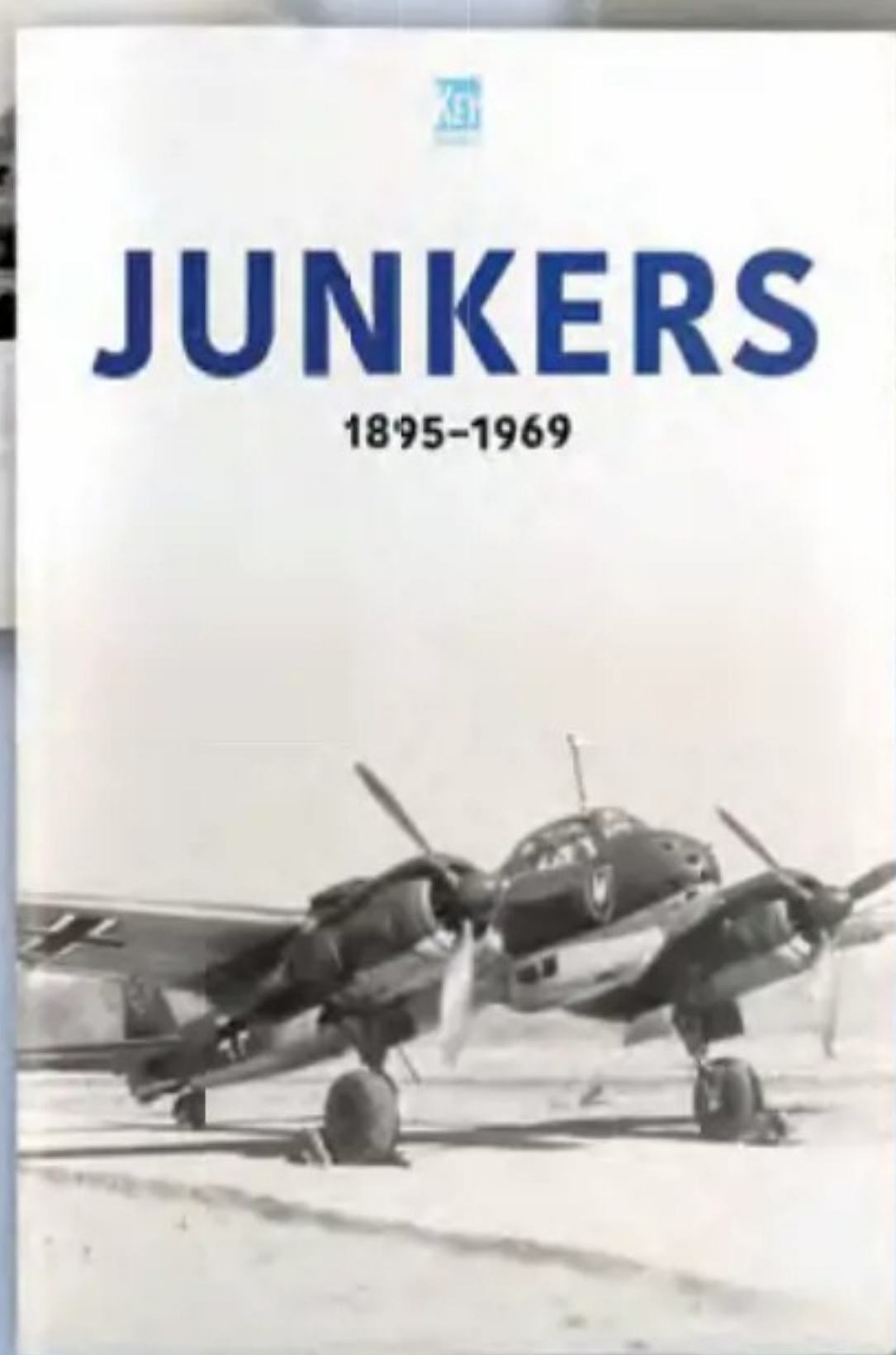
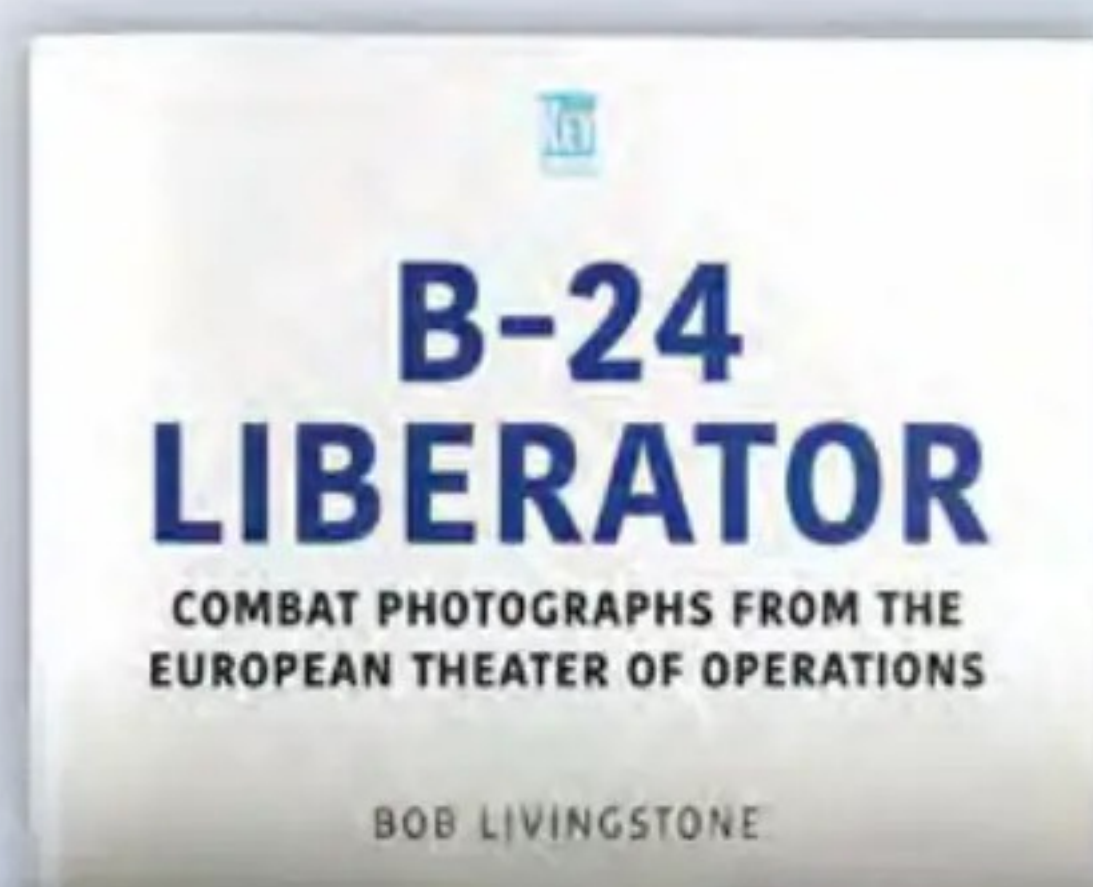
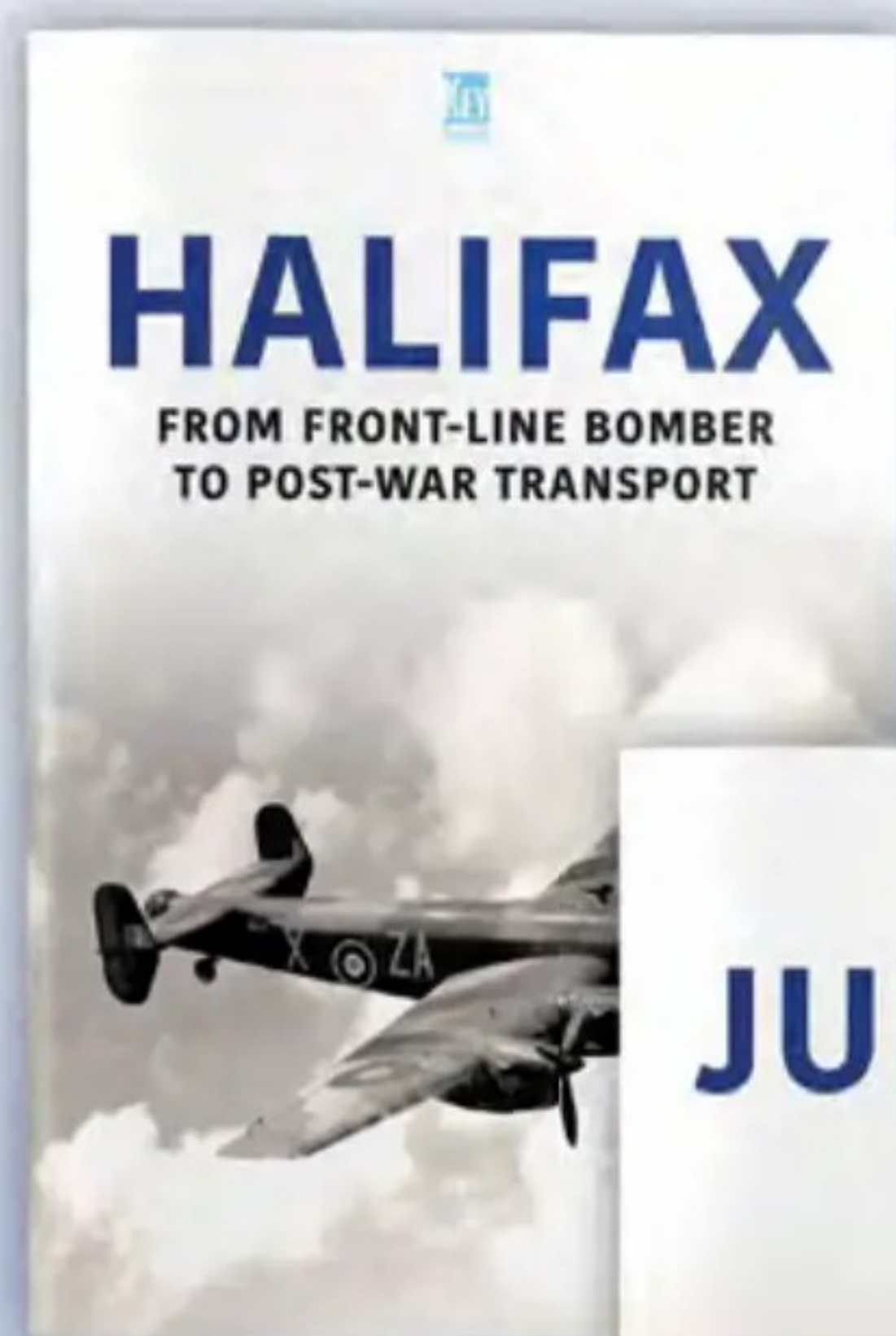


With thanks to Peter Amos and David Elliott.

ABOVE: There must be few historic aeroplanes active today with such a convoluted background as this Falcon. LUIGINO CALIARO

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TSR2



SPECIAL

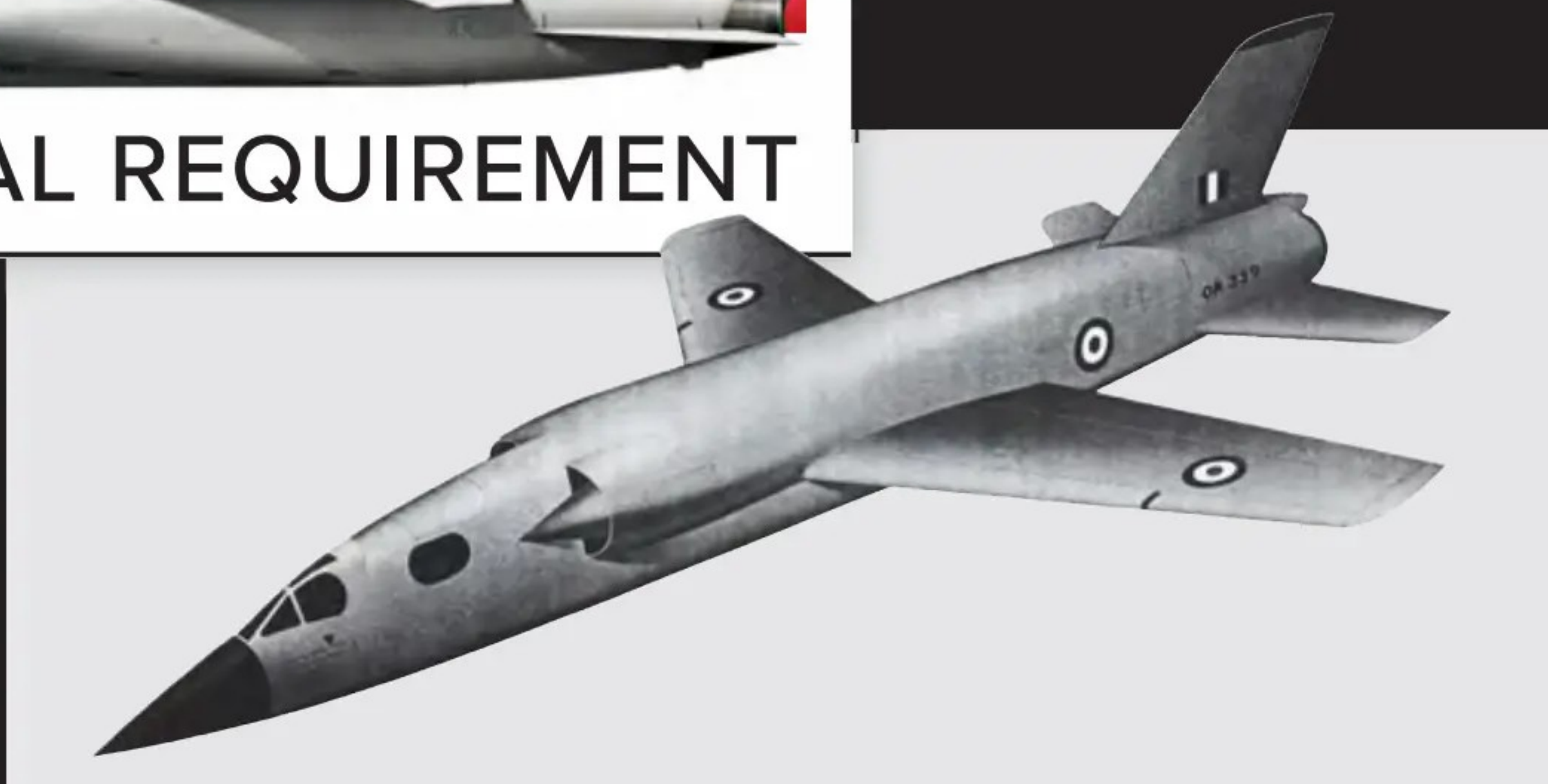
THE FINAL RECKONING

INCLUDING...

- The original specification
- The fateful Cabinet meeting
- The cancellation reassessed
- The aircraft fates

TSR2 SPECIAL

THE ORIGINAL REQUIREMENT



MISSION: IMPOSSIBLE

When the Air Ministry issued general operational requirement GOR339, little could it have predicted how notorious the eventual outcome would be. Yet, even at this stage, what morphed into the TSR2 programme was a deeply political affair with ramifications for the entire British aircraft industry **WORDS:** CHRIS GIBSON



As ever with military aircraft, almost as soon as one type came into use, its successor was being looked at. This was the case with the English Electric Canberra, which entered service as the Canberra B2 in January 1951 with No 101 Squadron. The Air Staff were considering a replacement, but at the time all the effort was being directed to bringing the strategic deterrent and the ‘V-bombers’ into service. The RAF’s penchant for low-level operations such as ‘Chastise’ and ‘Jericho’ led to the Canberra being used at low altitude as a tactical bomber and intruder. Almost a decade before Gary Powers’ U-2C was shot down by S-75 (SA-2 ‘Guideline’) SAMs over Sverdlovsk on May Day 1960, the Air Staff were looking at low-level operations against targets in eastern Europe.

Of course, in the early 1950s the British still had an empire to defend, specifically around the Indian Ocean, so this new bomber would be required not only for Cold War operations in Europe but limited — imperial — wars in the Far East. Conflict in Europe would be all-out, defined by the ‘trip-wire’ policy with nuclear strikes against targets in eastern Europe by Canberras armed with tactical nuclear weapons, while limited wars would have required Canberras toting high-explosive (HE) bombs and air-to-ground rockets. Guided weapons were in

their infancy in the early 1950s, but they were very much in the wings and being considered for the Canberra follow-on.

Various Canberra replacement proposals appeared, such as modified DH Sea Vixens and Supermarine Scimitars, but were considered old hat. Among the more modern designs was a variant of the Admiralty’s NA39, which became the Buccaneer and would ultimately fill the role just over a decade later. Faced with this situation, the Air Staff examined

“Performance was where the Air Staff wish-list would ultimately meet reality”

a low-altitude strike aircraft. In the early 1950s, the sky was, for want of a better expression, the limit. Aircraft performance was increasing yearly, if not monthly, and the aircraft companies were promising the earth. So, that’s what the Air Staff asked for.

The requirement called for a self-contained, all-weather bombing system with the range to allow effective operations from the limited number of overseas bases

available to the RAF. In a global ‘hot’ war, missions would need to be conducted from outside the highly vulnerable tactical area — in other words, from bases in the UK. Canberras provided the RAF’s tactical strike and reconnaissance force but by 1965 they would need to be replaced.

The aircraft’s primary role was to be the delivery of tactical nuclear weapons, known to the British as ‘strike’ missions. Bombs were to be delivered from “low altitudes up to the maximum ranges available” and “with minimum consideration for prevailing weather conditions, by day and by night”. Secondary roles included all-weather tactical photographic reconnaissance at medium level by day, and at low level by day and night, plus all-weather ‘electronic’ — meaning radar — reconnaissance within the constraints of the primary role.

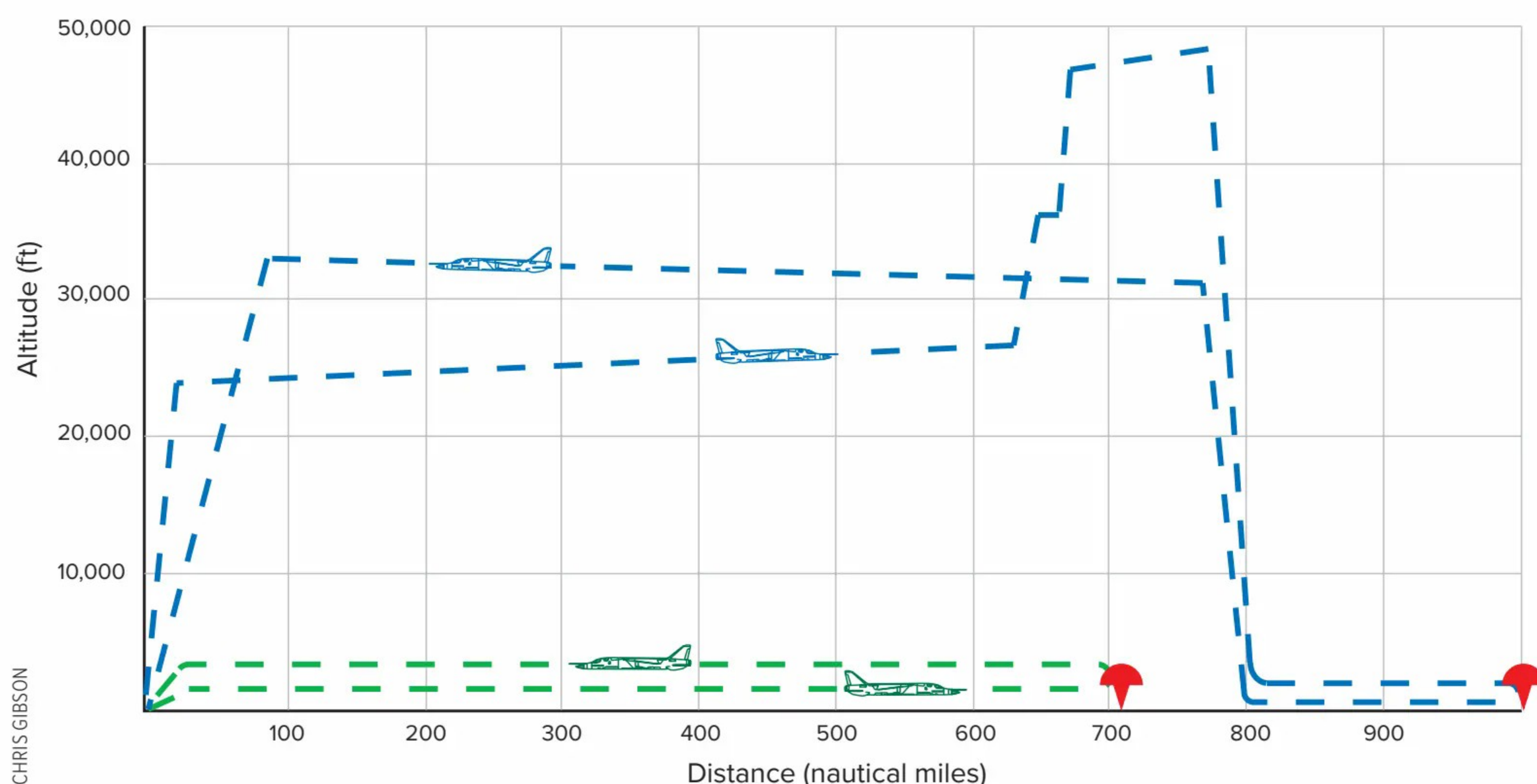
Like the Canberra, the GOR339 machine should be capable of delivering “tactical nuclear weapons by day and night from medium altitudes using visual and blind bombing techniques”. It was also required to drop HE bombs and fire rockets “under visual conditions as an alternative to the tactical nuclear weapon.”

Performance was where the Air Staff’s wish-list would ultimately meet the harsh reality of engineering and, probably more importantly, cost. Just about every aspect of GOR339 was at or beyond the limits of available aerospace ➤

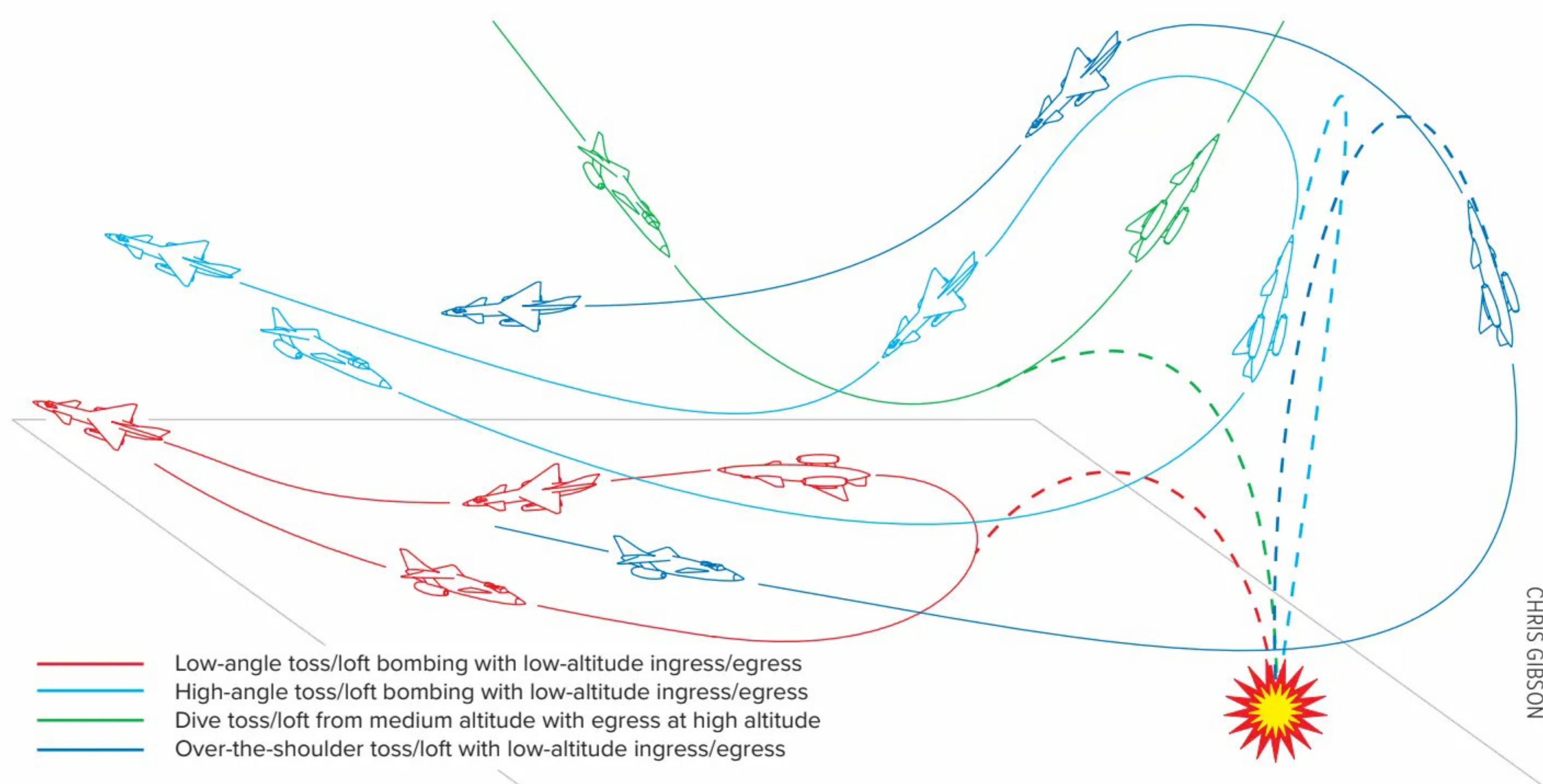
OPPOSITE PAGE: Period models and illustrations of — clockwise from top left — the Fairey Type 75, Avro Type 739, BAC P17A, Hawker P1129, Vickers Type 571 (Large), de Havilland GOR339, Bristol Type 204 and Vickers Type 571 (Small).

VIA TONY BUTTLER, ALAMY AND BAE SYSTEMS

GOR339 MISSION PROFILES



MANOEUVRES FOR RED BEARD DELIVERY AND GOR339'S HANDLING REQUIREMENT



technology, as the Air Staff were demanding the companies apply the latest know-how.

GOR339 stipulated a radius of action of 1,000nm (1,852km) at 1,000ft (305m), with the last 200nm (370km) to and from the target at low level, less than 150ft (46m). For deployment to the Far East, a ferry range of 2,000nm (3,704km), without resorting to air-to-air refuelling, was necessary.

In an era when air speed records were tumbling, speed was viewed as critical to survival on a strike mission. GOR339 said the aircraft's

speed should be as high as possible and not less than Mach 0.95 at sea level, with a supersonic dash over the target. This was particularly challenging and determined the aircraft's configuration, due to the turbulent conditions at low altitude.

The take-off performance requirement reflected the contemporary thoughts on runways and their vulnerability to attack. As a result, GOR339 prioritised short take-off and landing performance, with a "maximum runway length of 1,000 yards (914m) should it not be possible to avoid runways altogether". This, for an aircraft possessing the intended performance, was a tall order and the type to meet GOR339 would need high-lift devices such as blown flaps, thrust-vectoring or even lifting platforms.

The aircraft was to deliver the weapon by toss-bombing from low level and dive/toss from medium altitudes, so would need good handling and manoeuvrability. Toss-bombing — known as loft-bombing or low-altitude bombing system (LABS) to the US Air Force — involved releasing the weapon in a pop-up manoeuvre to 'throw' the weapon toward the target. This allowed the aeroplane a degree of stand-off but mainly avoided damage from the weapon's blast/heat waves, and in the mid-1950s was the delivery method of choice for tactical nuclear stores.

GOR339's primary weapon was to be the bomb to meet OR1127. This was developed under the rainbow code Red Beard and would enter service as 'Bomb, Aircraft, HE,

2,000lb MC'. In RAF parlance, MC stood for 'medium capacity', but when applied to nuclear weapons it identified a weapon in the kiloton range. Alternative loads for 'limited war' included four 1,000lb (454kg) bombs, 74 2in (5cm) rocket projectiles to OR1008 or 12 3in (76mm) air-to-ground anti-tank rockets to OR1099.

The navigation requirement was for a self-contained system with a clear display showing the aircraft's position to an accuracy of 1nm (1.8km) at low level and 2nm (3.7km) at medium altitude. This statement allowed the aircraft and systems developers free rein to produce a navigation system at a time when a range of options were becoming available, including inertial, automatic astro, radar and radio aids.

For the delivery of Red Beard, a circular error probable (CEP) of 1,200ft (366m) was essential, a feat that could only be achieved under visual conditions. CEP is defined as the radius of a circle around the aim point within which 50 per cent of weapons aimed at an aim point will land. The operational requirement document also stated, "However, future developments of nuclear weapons may permit some relaxation of the required bombing accuracy", meaning more powerful weapons would allow increased CEPs. Note that Red Beard Mk1 had a yield of 15kT or 25kT for the Mk2 while its replacement, WE177A, had a variable yield between 20kT and 200kT.

WHEN ONE DOOR SHUTS...

Why did many of the GOR339 proposals feature a variation of the rotary bomb door used on the Blackburn NA39 Buccaneer? In the early days of the Blue Danube nuclear weapon's development, when employing the Vickers Valiant for drop tests, the 'shapes' used for trials were aerodynamically very clean and observed to 'loiter' in the bomb bay after release, moving away from the Valiant too slowly for comfort. This was immediately solved by adding vanes forward of the bomb bay but ultimately by changing the shapes of later weapons. Carriage in a bay allowed early nuclear weapons, sensitive to temperature changes, to be coddled in a benign environment while a rotary bomb door permitted the weapon to be exposed quickly while sealing the bay to prevent turbulence within. Once nuclear weapons matured and became more robust — the British WE177 was designed to survive being dropped from low level at high speed — they could be carried externally, making the complications of a rotary bomb door and its variations unnecessary.

When delivering conventional — HE — weapons, the CEP was 600ft (183m) using visual techniques such as the standard pilot attack sight or navigator-operated sighting systems. Blind bombing would rely on ground-based radio aids, which had a limited range, typically 200nm (370km).

In the case of low-altitude reconnaissance missions, the GOR339 aircraft was to be equipped for vertical photography by day and night from 500-5,000ft (152-1,524m) with sufficient film for at least 80nm (148km) coverage plus oblique photography from 200-5,000ft (61-1,524m). Medium-altitude reconnaissance included vertical photography from 5,000-36,000ft

(1,524-10,973m) with sufficient film for 200nm (370km) coverage.

Automatic exposure and image movement compensation was to be incorporated in the photographic reconnaissance package, and to aid post-mission analysis the ground position of each photograph was to be recorded on the film. The aircraft was to carry a basic reconnaissance suite as standard, but a dedicated reconnaissance pod or pallet in the weapons bay was also demanded.

Radar reconnaissance was seen as the only technique that allowed all-weather night and day reconnaissance, with GOR339 stating, “radar reconnaissance with a self-contained navigation system was desirable”. Desirable was very much an understatement. Such a system had proven its worth

“Speed was viewed as critical to survival on a strike mission”

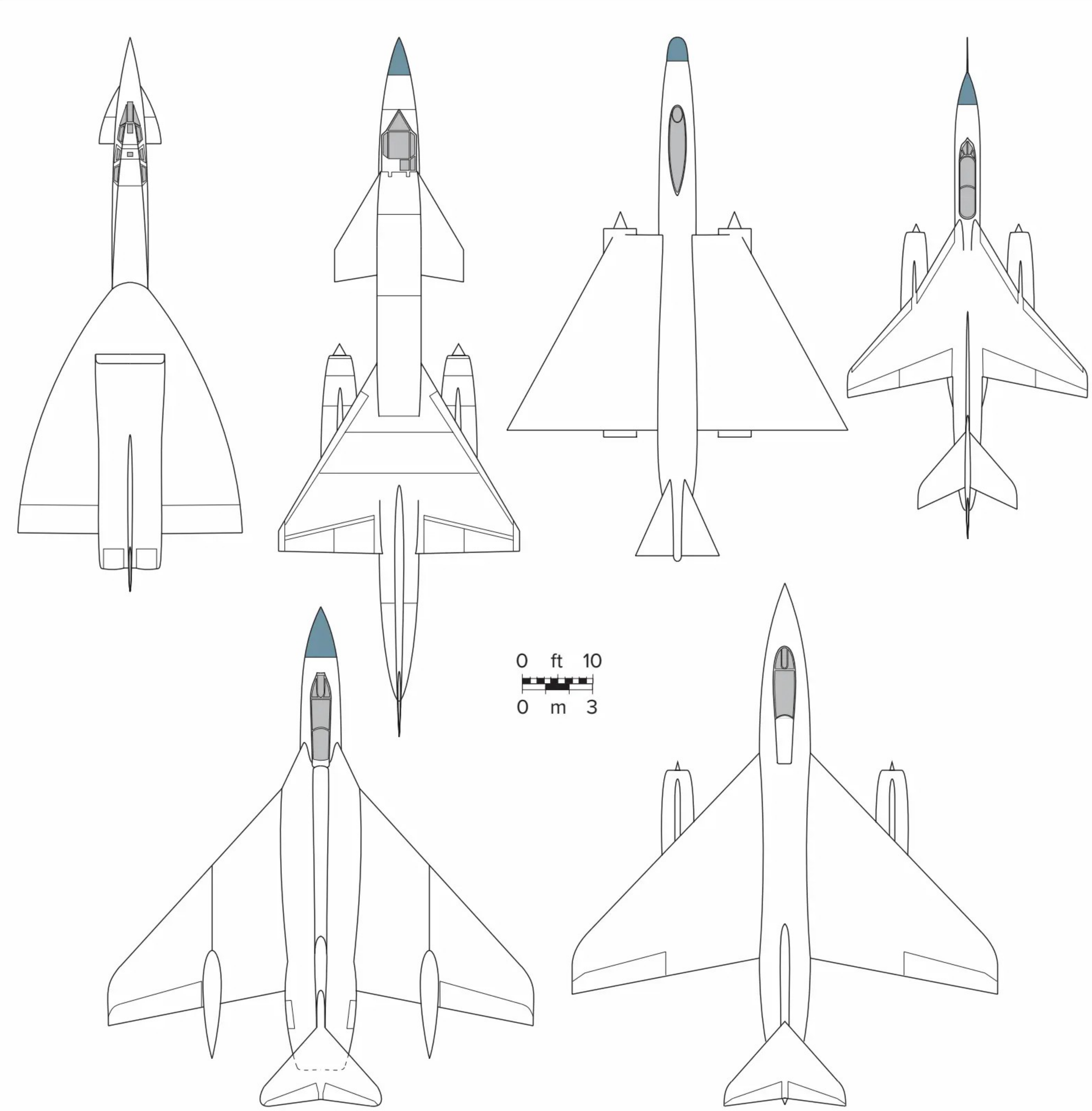
on Canberras with Blue Shadow and sideways-looking airborne radar providing navigation and a reconnaissance capability that was becoming increasingly useful.

An infra-red (IR) line-scan system with data transmission was another GOR339 necessity. In the most basic form such systems use an IR sensor and a mirror scanning normal to the aircraft track. This

scanned the ground below and to the sides of the aircraft, building up the image as a series of lines, hence the name. IR imaging could be used day and night to show heat sources, such as concealed vehicles. Interestingly, despite listing IR line-scan in GOR339, it would be a ‘white light’ system that was selected for the operational aircraft, requiring a separate pulsing light source synchronised with the scanner for night use.

An example of how the Air Staff’s GOR339 wish-list came up short when practicalities were considered was the statement that the greatest attention was to be paid to crew comfort. On a high-speed aircraft at low altitude the ‘ride’ could be rather bumpy, and the Air Staff stated it would

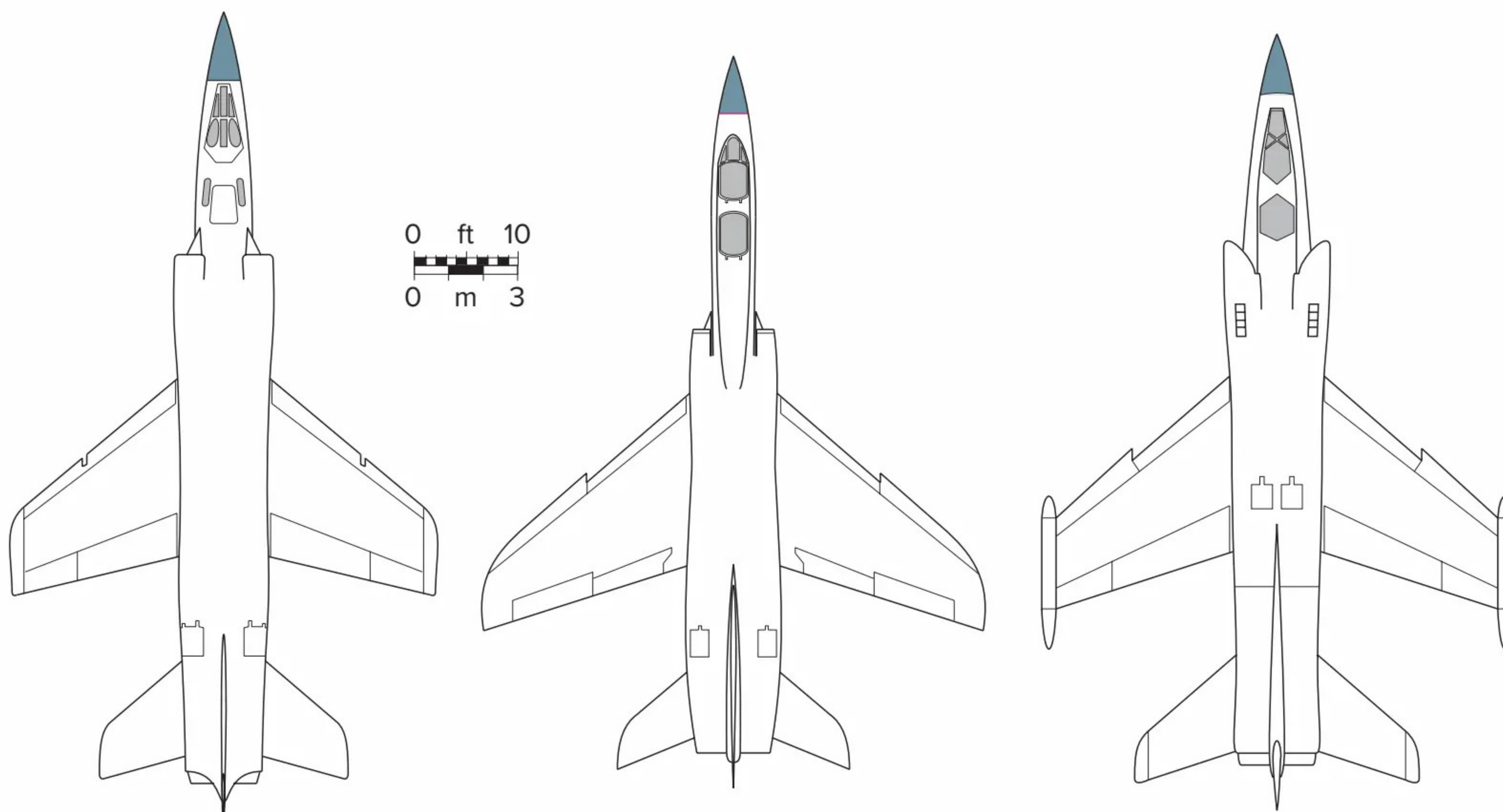
GOR339 ‘NO-HOPERS’



LEFT:
Top row, left to right: Bristol Type 204, Fairey Type 75, Handley Page GOR339 and de Havilland GOR339. Lower row: Gloster P386 and P384.
CHRIS GIBSON

RIGHT: Hawker Siddeley Aviation's Combined Strike Aircraft (right) evolved from a merger of the Avro 739 (left) and Hawker P1129 (centre). CHRIS GIBSON

HSA'S CONTENDER



“be necessary to provide some form of gust alleviation”. One solution was to reduce the size of the wing to minimise gust response. Reducing the wing area, with the corresponding increase in wing loading, impacted the take-off performance, requiring the high-lift devices mentioned earlier.

The requirement also said crew and camera compartments needed to be protected from nuclear, biological and chemical contamination in flight and on the ground. Given the aircraft’s operating environment, it would be vulnerable to small arms and light anti-aircraft fire, so the requirement stated that the “Possibility of providing some armour below and behind the crew positions is to be examined and the penalties involved made known to the Air Staff.”

The Contenders

When GOR339 was issued, a number of ‘fast jet’ requirements were in progress. There was the interceptor to OR329 and the reconnaissance aircraft to OR330, so GOR339 attracted proposals from most of the aircraft companies in the UK, including some unlikely airframers. Some, such as Handley Page, submitted studies that were not ‘formal’, indicating that their design teams were more interested in other areas of the aerospace business.

Handley Page’s undesignated offering was the antithesis of its Victor and appeared to have been designed for simple construction, or it could be argued the design office had mislaid its collection of French curves. The twin-engine concept comprised a basic cigar-shaped fuselage surmounted by a wing with straight leading and trailing edges between the fuselage and underwing engine pods, the outer wings being deltas with a

“ GOR339 attracted proposals from most of the UK aircraft companies ”

leading-edge sweep of 62°. Handley Page indicated that it incorporated a gust-alleviation system to provide good performance at low level without compromising high-altitude performance.

A single bypass turbojet, possibly a Rolls-Royce Conway, or a turbofan such as the RB141 was mounted under each wing with a butterfly tail to avoid being affected by engine efflux. Handsome it was not, and the type would have had difficulty achieving the low-level supersonic

dash over the target demanded by the requirement, although it would be a comfortable ride.

In the early 1950s Gloster Aircraft had proposed a development of the Javelin, the Thin Wing Javelin (TWJ), as an interceptor, photo-reconnaissance and bomber aircraft. The RAF was not interested but five years on, as a response to GOR339, Gloster took the TWJ’s wings and tail and mated them to an enlarged fuselage that accommodated more fuel and a Red Beard bomb, making the P386.

For the P384 study the TWJ’s wings and empennage were mated with a new cigar-shaped fuselage, and the Bristol Olympus Ol 21Rs (‘R’ standing for ‘reheated’ in British engine nomenclature) were moved from the rear fuselage to pylons under the wings. This change in configuration required a new undercarriage, Gloster opting for the bicycle and outrigger configuration that was all the rage at the time.

Gloster struggled to meet the requirement. To meet the range performance, its design had to be large, while achieving the necessary weight meant a smaller airframe, which would have reduced the range. Such were the difficulties in squaring that circle, Gloster did not submit the design to tender.

Fairey appears to have made the same radical changes to an

existing design, specifically the Project 57/FD3 to meet OR329/F155. Having initially considered a variant of its winning F155 delta-wing proposal, Project 57, with the Red Beard on underwing pylons, Fairey re-examined this to meet GOR339 as Project 75. It applied lessons learned from the Delta 2 supersonic research aircraft. The FD3's large wing was unsuitable for low-altitude flight so a smaller delta wing was mounted on top of the fuselage with the cropped delta canard just aft of the cockpit. The wings carried pylon-mounted Rolls-Royce RB142R Medway turbfans rated at 8,000lbf and 13,000lbf with reheat. As with the Gloster design, a bicycle undercarriage was adopted with the outriggers housed in the engine nacelles and the main bogie retracting into a bay just aft of the bomb bay.

The Fairey 75's bomb bay was interesting and innovative, as it featured a rotating bomb door as first seen on the Martin XB-51 but used on the Blackburn Buccaneer and — interestingly in a discussion about a Canberra replacement — the Martin B-57.

Measuring just over 100ft (30.5m) long, which is longer than a Vulcan B1, the Fairey 75 was the largest of all the GOR339 proposals and the only one to feature side-by-side seating rather than tandem. Fairey advised this provided the pilot with a better forward view over the large nose, thus avoiding complications such as tilting noses or cockpits.

Possibly the most handsome proposal for GOR339 came from Filton in the form of the Bristol Type 204. Its gothic arch delta and canard, coupled with a dorsal air intake for the two Ol 22R engines, lent the 204 a futuristic look, albeit less futuristic than it could have been as Bristol had intended an aircraft with an integrated wing/fuselage as seen on the earlier Type 198 airliner studies. The 204's exotic appearance was compounded by the variable-incidence canard whose rear portion acted as a flap, but was unique in being mounted on a pylon under the nose, separated from the fuselage by almost 2ft (0.6m). The rationale for this configuration was GOR339's stringent take-off requirement, for which the canard was felt ideal by Bristol's designers.

The Bristol 204's weapons bay could fully enclose a Red Beard and used a variation on the rotating

bomb bay seen on the Fairey Type 75. The bomb was carried on a pallet that swung up and to the starboard side of the bay, meaning the bomb was carried on its side, with a second pallet/fairing on the port side. The bay was closed by a pair of bi-fold doors — to deliver the weapon, the doors opened and the bomb pallet and fairing swung down to expose the bomb and close off the bomb bay, avoiding turbulence. The 204 could also carry stores on two pylons under each wing.

As noted, de Havilland's designers had initially proposed a modified DH110 Sea Vixen for GOR339, to be fitted with the Rolls-Royce RB133, a developed Avon put forward for the Canberra PR9. They soon realised an aeroplane with its origins in 1946 could not be viable into the 1970s and '80s as demanded by GOR339.



The new design, reminiscent of the contemporary Yakovlev Yak-28 'Brewer', was conventional: swept wings mounted high on the fuselage plus similarly swept tail surfaces. The wings were interesting, each carrying a podded RB142R engine on an underwing pylon, and to provide the STOL performance demanded by the requirement the entire wing tilted. It was now called a variable-incidence wing, as seen on the Vought F-8 Crusader. Since the engines were mounted on the wings, this also provided jet deflection for take-off and landing. Additional thrust for short take-offs or a rapid climb to cruise altitude would come courtesy of a de Havilland rocket engine installed in the tail cone.

Yet again a bicycle undercarriage was used, including a four-wheel bogie main unit with the outriggers in the engine pods. The Red Beard was to be carried internally with bulged bomb bay doors to enclose it. External stores could be mounted on underwing pylons outboard of the engine and tangential pylons on the lower rear fuselage.

The crew occupied a fully glazed tandem cockpit on hydraulically damped seats to reduce crew fatigue in those high-speed/low-altitude mission profiles GOR339 demanded. The seats were stepped to ensure

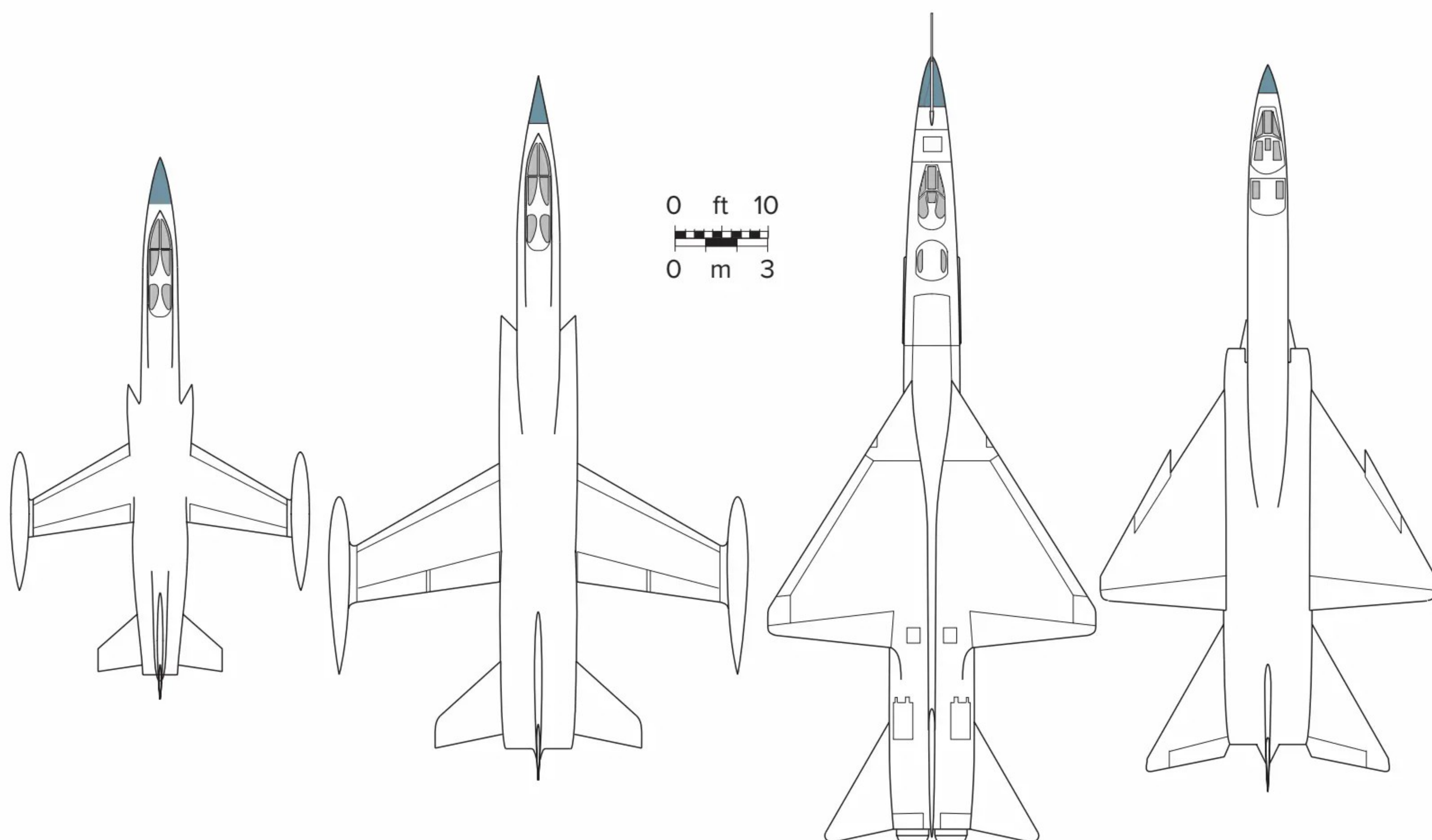


GOR339 TIMELINE	
1951-56	Various Canberra replacement studies carried out, including joint RAF/RN NA39 Buccaneer
November 1956	Steering committee set up to work on what would become GOR339
March 1957	GOR339 finalised and sent to Controller, Aircraft (CA) ACM Sir Claude Pelly; various design studies examined but none meets putative requirement
April 1957	CA reluctant to accept GOR339 without assurance of its necessity
June 1957	Air Council — governing body of the RAF until merger of Air Ministry into the Ministry of Defence in 1964, when it became the Air Force Board — re-examines and endorses need for GOR339; draft OR submitted to Defence Research Policy Committee (DRPC)
September 1957	GOR339 issued to nine aircraft companies for examination, with caveat they should collaborate; CA also asks them to indicate with whom they were willing to collaborate
February 1958	Brochures received from the nine companies; Vickers-Armstrongs happy to collaborate with English Electric and Shorts, and EE with Vickers
March 1958	NA39 (Buccaneer) re-examined and rejected again by Air Staff
May 1958	New draft GOR339 submitted to DRPC by Air Council
November 1958	Minister of Defence Duncan Sandys accepts Air Ministry case for GOR339; Ministry of Supply seeks Treasury authority for funding
January 1959	Minister of Supply Aubrey Jones announces development study contract with Vickers and EE; first mention of the designation TSR2
February 1959	Air Staff declares GOR339 dead and new requirement, OR343, issued
May 1959	GOR339 officially superseded by OR343

RIGHT: What ultimately became the BAC TSR2 involved the two Vickers 571 designs (left) and the English Electric P17A (third from left) with the resulting 'Combined' BAC 571 on the right.

CHRIS GIBSON

BAC'S CONTENDER



the back-seater had a good all-round view.

Who better to replace the Canberra than the Canberra's builder? By the time GOR339 was issued to the companies in March 1957, English Electric at Warton had gained experience in supersonic aircraft development from its work on the P1B Lightning. It also had considerable knowledge of taking a jet bomber, the Canberra B2, into service and developing it for several roles. Short Brothers, involved with Canberra work, partnered with English Electric to work on the short-field aspects of GOR339. For its P17A proposal, English Electric pretty much ignored the Air Staff's short-field wish-list, leaving such matters to Shorts with its P17D lifting platforms.

After pursuing various configurations including trapezoidal and delta wings with wingtip or underwing engines and variable-geometry wings, the Warton team settled on the tailed delta now familiar as the P17A. Mounted high on the fuselage, the P17A's delta wings spanned 35ft (10.7m) with leading-edge sweep of 60°. Its small wing area of 610 square feet (56.7 square metres) would produce a high wing loading but lower gust response, providing a more comfortable ride at low altitude. The tailplanes, mounted low on the rear fuselage, initially

shared a planform with the P1B but were all-moving, while additional yaw stability came from a pair of strakes/ventral fins on the rear fuselage.

The P17A was to be powered by a pair of reheated Rolls-Royce RB142R turbofans rated at 8,000lbf and 13,000lbf with reheat. These were installed within the rear fuselage and fed from a pair of F-4 Phantom-style box intakes on the

“ By early 1959 the Air Staff's scattergun approach to GOR339 was a bit more rigorous ”

fuselage sides just aft of the leading-edge wing roots. The Bristol Ol 15R was also mentioned in the Air Ministry documents but does not appear to have been followed up.

The Red Beard and other stores such as rocket pods would be internally carried on a rotary bomb door. There appears to have been no intention to carry stores on underwing pylons, but no doubt that would have changed in time.

Vickers' submission for GOR339 was two-handed, the designs being designated Type 571 (Large) and Type 571 (Small) with the former being twin-engined and the latter using a single powerplant. They shared a configuration: a shoulder-mounted 30° swept wing with tip tanks, a tandem cockpit, box intakes with forward-swept edges and, interestingly, an all-flying tail fin. Both types were to be powered by the Rolls-Royce RB142R, the Large with two of them, the Small with one. To allow the Type 571 (Small) to meet GOR339, Vickers' electronics department was to develop specialist miniaturised equipment — what we now know as avionics.

Those were the outsiders. But what of the feasible contenders? Around the time GOR339 was being written, the first discussions about merging the many aircraft companies were being held. Put simply, too many firms were competing for less work and that work was for increasingly complex, efficient aeroplanes. The latter meant fewer aircraft were required while the former meant fewer companies would be viable. The aim was to restructure the British aviation industry by reducing the number of companies through the letting or withholding of contracts. One such contract would be the GOR339 machine.

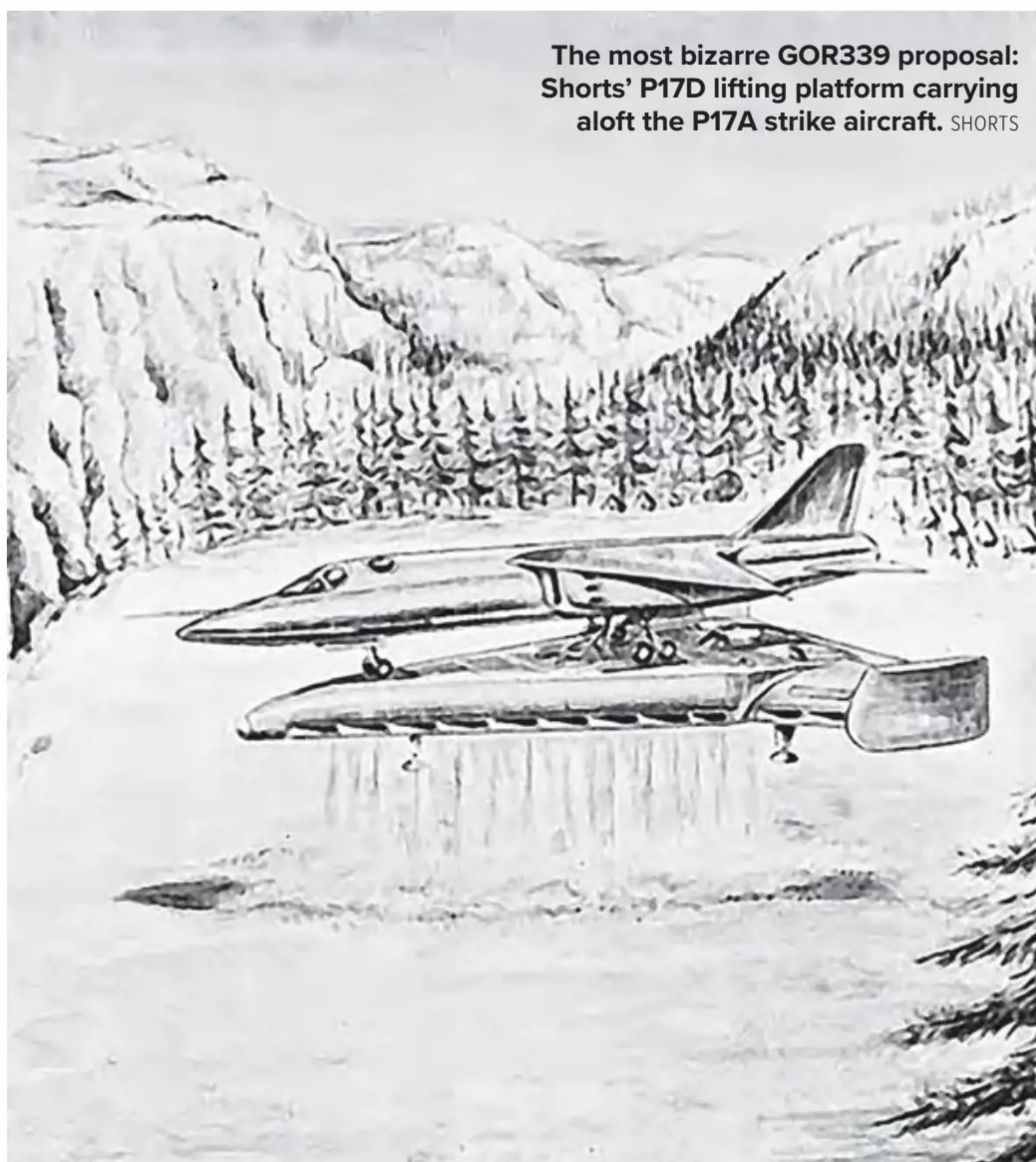
Hawker at Kingston had proposed a variant of its P1121 strike fighter for GOR339 but it was the P1129 that addressed the Air Staff's requirement. Like Hawker, Avro at Woodford produced a proposal, the Type 739, with both perceived as attempts to show Kingston's and Woodford's independence within the Hawker Siddeley Aviation Group.

The P1129 and Type 739 were similar in size, 72ft 9in (22.2m) versus 74ft 3in (22.6m), and shared a similar configuration: low wing, tandem cockpit, low tailplanes and twin engines in the rear fuselage. The P1129 could only carry Red Beard semi-recessed while the Avro 739 could take it within its bomb bay which used an ejection system based on that of the Avro 730 supersonic bomber. Experience from developing the Type 730 and earlier Type 721 bombers contributed to the Type 739.



Apparently corporate embarrassment resulted from this duplication of effort and Hawker Siddeley's management informed the Ministry of Supply (MoS) that the Avro design was the one to examine. Suffice to say some personnel in the Air Staff and MoS went 'rogue' and encouraged Hawker to continue, with a two-seat variant of the P1121 and P1129. However, by the end of 1958 the hatchet was buried. A joint proposal that incorporated features of the P1129 and Type 739 was submitted to the Air Staff and MoS as the design to consider.

The result was the Hawker Siddeley P1129 Combined Strike Aircraft, which — as the designation suggests — took much of its design from the Hawker machine, especially the Hawker trademark wings and empennage. The air intakes were mounted on the upper quadrants of the fuselage just aft of the cockpit, but an unusual feature not seen on either of the original proposals were forward-swept, curved intake edges. In addition to the weapons bay, the P1129 had three hardpoints under each wing, with at least one plumbed for a fuel tank. Hawker Siddeley stated the wingtips could be replaced with tip rails for weapons, such as pods for 2in (5cm) rockets.



The most bizarre GOR339 proposal: Shorts' P17D lifting platform carrying aloft the P17A strike aircraft. SHORTS

KEEPING IT SHORT

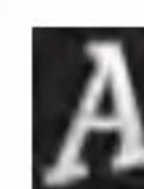
GOR339 called for short-field performance and most of the submissions mentioned techniques such as rockets, flap-blowing or even vectored thrust, with the de Havilland design using a variable-incidence wing. Landing distance was reduced by methods including parachutes and arrestor hooks. Only two offerings, the Bristol Type 204 and Handley Page GOR339, featured reverse thrust. For the Vickers 571 Large and Small, Vickers talks about a mysterious technique for reducing the landing and take-off distances of the two designs, Fire Hose.

English Electric and Short Brothers proposed a separate vertical take-off lifting platform, the P17D, which would carry the P17A into the air and accelerate until sufficient speed was achieved to allow the P17A to be released and fly away. Landing involved the two aircraft matching speed and the P17A being captured by the P17D, with the combination slowing down for a vertical landing.

Meanwhile two other companies came together to address GOR339. English Electric Aviation at Warton and Vickers at Weybridge had earlier indicated they were prepared to work together on developing the Canberra replacement. The Vickers/EE machine, described as the Joint Datum Aircraft, dated from April 1959 and took the configuration of the P17: shoulder-mounted delta wing and tandem cockpit with the Vickers 571's rectangular intakes mounted forward of the wings rather than the underwing intakes of the P17. It also used the all-flying

tail fin from the Type 571. This Joint Datum Aircraft was one of the first designs that is recognisable as a TSR2, and it was this that was selected for development.

By early 1959 the Air Staff's scattergun approach to GOR339 was a bit more rigorous and with the EE/Vickers design selected for development a specification, RB192D, was issued. The Air Staff on 19 February 1959 declared GOR339 was dead and a new, more focused requirement, OR343, was issued. That, in turn, led to the great TSR2 saga.



TSR2 SPECIAL



THE CABINET'S CHOICE

The **MOMENT** *of* **TRUTH**

Reconstructing the Cabinet meeting at which the TSR2's fate was sealed **WORDS:** BEN DUNNELL

BAE SYSTEMS VIA MALCOLM ENGLISH

The Cabinet room, shortly after 10 o'clock on the morning of 1 April 1965. Prime Minister Harold Wilson and his colleagues gathered in the heart of 10 Downing Street to chew over a range of affairs, but one was of the most pressing importance. After covering two Viet Cong bombings in Saigon which had killed 42 people, and the government's outline national plan, they turned to the topic which would dominate: TSR2.

This was crunch time for Britain's most contentious military aircraft programme. The decisions taken in that meeting would not only be of great significance for the future of the RAF and broader UK defence policy, but they would also have a direct effect on thousands of workers in the industry, and go on to resonate in symbolic terms for decades. Of course, the outcome is well-known: against the TSR2, in favour of the General Dynamics F-111, still being referred to by the title given to the requirement that gave rise to it, TFX. But how, exactly, did the proceedings play out?

The precise course of events we know from the minutes. Taken by Cabinet Secretary Sir Burke Trend, they provide a unique, contemporaneous historical record of a decisive juncture in aviation history. While they are preserved in their original note form, we can use that to reconstruct the discussion as accurately as is possible without the benefit of a recording or verbatim transcript. The Minister of Aviation, Roy Jenkins — not a Cabinet member — entered the room, and Wilson opened the debate.



Harold Wilson, Prime Minister: Some of the information lacking in February is now available, including the inability of BAC to produce a firm price, and the matter is now ripe for a decision. Substitution [of the F-111 in place of the TSR2] means a budgetary saving of £250-300 million at the expense of a dollar outlay of £400-500 million. It is very doubtful whether the released resources would create the required exports. From this point of view it is a bad bargain. But cancellation, even allowing for that, might reinforce the Budget in strengthening confidence in sterling. Therefore it is relevant to ask whether cancellation must involve the purchase of TFX. This



ABOVE: At an April 1965 press conference, the Secretary of State for Defence, Denis Healey (centre), discusses the government's decision to cancel the TSR2; Minister of Aviation Roy Jenkins is on the left, with Minister of State for the Air Force Lord Shackleton at right. Healey favoured replacing the TSR2 order with one for F-111s, while Jenkins was far more equivocal at the time, though he later wrote he was in favour of abandoning it. ALAMY

will not be wholly certain until the defence review. But other 'mixes' are possible, and roles must be clarified. Add the political impact of cancellation: redeployment [of workers] is less formidable than we originally feared, even though we can't discuss it with BAC. But the argument of dependence on the US aircraft industry, who are increasingly forceful, is very strong... And technical dependence could mean political dependence, which

“The argument of dependence on the US industry is very strong”

would be very damaging. We must therefore decide whether to take the risk of cancelling TSR2 and then finding TFX inescapable. If so, I would prefer to let TSR2 run on rather than accept now an extra burden on our balance of payments.

Denis Healey, Secretary of State for Defence: Expenditure on TSR2 is mounting, and no information affecting the decision is likely before the autumn.

On the need for the aircraft, I have examined 'mixes' of Buccaneer, Phantom, Kestrel [in production form, the Harrier] etc, but I have concluded that we are likely to need an aircraft with the range and payload of TSR2 or TFX, both for the strike role against hostile aircraft on the ground and for reconnaissance to anticipate hostile action. Ferry range eliminates many staging posts, and in the theatre itself it can be used from a wide variety of bases. Therefore, if we must remain able to fight a limited war anywhere, without being wholly dependent on the US, we must have some aircraft of this type.

On cost, it depends on the ratio of cost/effectiveness for these roles. On military grounds, TFX MkI [an F-111 with an initial avionics standard] is inferior to TSR2; the MkII [with upgraded avionics] is slightly superior. Cost depends on the numbers. We have cut, by eliminating conflicts in Europe, the numbers by 48 aircraft to 110 — the minimum required to sustain, for example, an Indonesian or Gulf war in the '70s. But 110 is a worst assumption. For TSR2 we have only a target — i.e. no profit — price, any excess over which falls on us. On this basis TSR2 would cost £4.8 million more than has been spent already and £5.8 million in total. The TFX MkI price is firm at £2.1 ➤

RIGHT: Prime Minister Harold Wilson expressed concern that killing off the TSR2 programme could, if not properly communicated, be seen as surrendering the aerospace industry to the Americans. George Brown, then First Secretary of State, was steadfast in his support for a Buccaneer purchase.

NATIONAAL ARCHIEF



BELOW: TSR2 XR219 meets the BAC workforce at Warton on 22 February 1965, having flown across from Boscombe Down for the first time. It was felt by the government that staff redeployment would be less of an issue politically than the matter of giving business to the USA.

ALAMY

million. Adding avionics for the MkII, including our contingency addition, would make it £2.6 million. If we include £70 million interest in TFX and £70 million cancellation charges on TSR2, then it's £3.6 million for TFX, but its running costs would be only half those of TSR2's. Hence a saving of £250 million over 13 years on budget — and £300 million over the next five years at a

very small dollar outlay. This would bring the total saving on the aircraft to £600 million.

Therefore, we should cancel TSR2 and take an option on TFX — which we may be able to reduce even if there is no cut in our commitments. If we cut the number of aircraft to 50, the cost advantage of TFX is very great — the unit cost of TSR2 is £9.4 million in total, while the unit cost of

TFX would vary very little and would be only about half the residual cost of TSR2. But we must have an option in order to justify cancelling TSR2: we can't decide to dispense with it altogether without pre-judging the defence review.

Our dependence on the US would be less if we have some TFXs of our own. The dollar burden is certainly heavy, and not likely to be offset by more than half. But the residual half is only £20 million a year: very small in relation to total dollar imports. The option should be for 10 MkIs on 1 January 1966 — the date of order — for training in 1968. An order for the MkII would be deferred until April 1967 and would be wholly open. Spey engines are a possible offset.

Roy Jenkins, Minister of Aviation: I don't oppose cancellation of TSR2, but its substitution by TFX is a different matter. Don't exaggerate the dollar earnings of released resources, particularly the loss of aircraft exports. It is foolish to commit ourselves to buy an aircraft which we may not be able to afford. The absence of a BAC fixed price is our only protection against a



crippling loss. And comparison with the price of TFX can be misleading — I want to study the Secretary of State for Defence's latest figures.

Healey: They are firm and largely independent of the numbers bought.

Jenkins: But it does vary according to whether the number is above or below 70. We must study the figures more if we are to rely publicly on the lack of a firm BAC price. Ten TFX MkIs are meaningless, unless it means a commitment to buy MkIIs, and then the decision has to be based on the switch, not price. Beware of the eagerness of the US to sell and of the difficulty of buying our way out of an option. And don't over-rate the offsets. For these reasons, cancel, don't switch, but keep some option and explore other mixes.

The meeting then adjourned to allow Cabinet members time to attend the memorial service for Princess Mary, the Princess Royal. It resumed at 22.00.

James Callaghan, Chancellor of the Exchequer: Cancellation of TSR2 would be a major point in convincing opinion we were in earnest about redeployment.

Frank Soskice, Home Secretary: If we cancel TSR2, can any other aircraft — apart from TFX — fulfil a role which we regard as indispensable?

George Brown, First Secretary of State: TSR2 began eight years ago after the Buccaneer had been adopted as a naval aircraft. If the Buccaneer had started as RAF, there would have been no TSR2. The role could be discharged by the Buccaneer, which is used by the South African Air Force as land-based. Its ferry range is only 500 miles less than TSR2's, and at operational — subsonic — level, its capability is as good as TSR2's or TFX's. Therefore we should not continue wasteful expenditure on TSR2, and try for 100 per cent perfection when 95 per cent perfection, the Buccaneer 2** [the Hawker Siddeley P150, a redesigned, supersonic Buccaneer with afterburning Speys and a new navigation/attack system], is within our reach. There is no need to replace it with TFX at a cost of £500 million in dollars, since only 10 would be useless and we should have to buy more, for which there



is no case. Therefore, we should examine a Phantom/Kestrel mix and Buccaneer, and discuss with the chiefs of staff other than the Chief of the Air Staff.

This would help the research and development and design teams, whereas TFX would not. The ordinary labour force — say 20,000 — should be easily absorbed and are badly needed, particularly if at Weybridge, not Preston. Therefore I concede the option on TFX, provided other options are open and examined and we cancel TSR2 now.

“ We should cancel TSR2 and take an option on TFX ”

Healey: We have a firm assurance from McNamara [Robert McNamara, the US Defense Secretary in Lyndon Johnson's administration] that the offer of price is open without any commitment except that an initial order must be by 1 January 1966.

Douglas Jay, President of the Board of Trade: It is difficult to judge the First Secretary of State's new proposal at such short notice. On the subject of redeployment, it is easy to exaggerate the export potential of released resources. Since January, the dollar cost has risen from \$400 million to \$500 million. If so, it is better to spend

an extra £250-300 million on completing TSR2.

On the option, if 10 TFXs are useless, the option is really a commitment to buy more, and then we are dependent on the US even more than we are already in respect of Polaris. Even if the order is reduced, the dollar liability is still heavy, our dependence on the US remains, and the export potential of BAC would be gravely damaged in the face of growing US competition. If we don't want *any* TFXs, that is a new situation which needs more examination.

Perhaps it is better to buy a smaller number of TSR2s — even at a higher unit cost — if we want some aircraft of this type.

Frank Cousins, Minister of Technology: I support the President of the Board of Trade.

Healey: The Buccaneer 2** is no more real than TSR2, and its range, bomb load and carrier capacity are not adequate.

Wilson: If we reject 1, carrying on full blast with TSR2, and 2, cancelling TSR2 and replacing with a firm order for TFX, there remain 3, cancelling TSR2 and making no replacement, 4, cancelling TSR2 and taking the TFX option without commitment, and 5, continuing TSR2 until the defence review is completed.

Healey: And 6, continuing TSR2 and taking the TFX option? I have strained McNamara's patience. If we let the option go for now, we may have to pay more later. ➤

ABOVE: F-111As 63-9768, the third pre-production example, and sixth aircraft 63-9771 with wings fully swept. The variable-geometry strike jet was still experiencing its own teething troubles when it entered the equation as a possible TSR2 replacement — and more were to come when it entered US Air Force service, ironically after the F-111K was itself canned by Britain.

USAF



ABOVE: A period artist's rendering of an F-111K, which may have been named Merlin in service. The RAF's variant was based on the F-111A but featured numerous changes including an all-new forward equipment bay incorporating the air-to-air refuelling probe, a weapons bay-mounted reconnaissance systems pallet and a bespoke centreline weapons pylon, while the undercarriage was that of the heavier FB-111A.

GENERAL DYNAMICS

Richard Crossman, Minister for Housing and Local Government:

If the review is in summer, there is a negligible amount at stake meanwhile. And does the Budget impact the matter? But dependency on the US does, and don't hurry this until the whole review picture is before us. The First Secretary of State's proposal would land us with TFX.

Anthony Crosland, Secretary of State for Education and Science:

I favour 3. We cannot afford to continue TSR2, we must release resources, and don't then waste them in paying for TFX for which there may be no military need.

Jenkins: If the option is really open, we should leave it open until other options have been explored.

Healey: I couldn't justify cancellation of TSR2 unless I could say what aircraft will replace it, if a replacement is found to be necessary. If the option is disallowed, we should go on with TSR2.

Callaghan: I would go for 4, believing we shall never take up the option.

Cousins: But don't risk the charge that we have transferred our

aircraft industry and a large part of our electronics industry to the US. Therefore I side with the President of the Board of Trade and the Secretary of State for Education and Science.

Callaghan: But go in with the French!

Fred Peart, Minister of Agriculture, Fisheries and Food: I favour 5, like the Minister for Housing and Local Government.

Frederick Lee, Minister of Power: I favour 3, but we should investigate the First Secretary of State's proposal on the Buccaneer: we should postpone the decision, however, until the industrial implications of cancellation are clear.

Lord Gardiner, Lord Chancellor: I favour 4.

Crosland: So, on reconsideration, do I.

Barbara Castle, Minister of Overseas Development: So do I. But we must cancel TSR2: postponement would be politically disastrous.

Douglas Houghton, Chancellor of the Duchy of Lancaster: To cancel TSR2 and go American is technological defeat. Therefore I favour 5.

Anthony Greenwood, Secretary of State for the Colonies: I favour 1.

James Griffiths, Secretary of State for Wales: So do I.

Herbert Bowden, Lord President of the Council: If the Buccaneer 2** is out [which Healey confirmed], substitution of TFX for TSR2 is too damaging politically. Therefore I vote for 5.

Soskice: I for 4.

Thomas Fraser, Minister of Transport: The option would be to surrender to the US. And it would be irresponsible to cancel TSR2 before the review. Therefore I vote 5.

Jack Diamond, Chief Secretary to the Treasury: I vote for 4 — and hope for the Buccaneer in the interim.

The Earl of Longford, Lord Privy Seal: I for 3.

Willie Ross, Secretary of State for Scotland: I for 5.

Ray Gunter, Minister of Labour: We can't risk the political damage of postponement again. Therefore I vote for 4.

Niall MacDermot, Financial Secretary to the Treasury: I also for

4. It is our insolvency which inhibits our foreign policy.

Jenkins: The nature of the option keeps changing: is it really open-ended? Otherwise, cancellation of TSR2 is very dangerous.

Healey: There is no commitment to buy TFX: the only stipulation is that if we take it up, we must place our first order by 1 January 1966. The price is firm for 110-70 aircraft: below 70 an R&D waiver is for negotiation.

Jenkins: Then I vote for 4.

Cousins: If there is an option, it will be exercised. Therefore I favour 5.

Crossman: I agree — entirely.

Edward Short, Chief Whip: I too favour 5.

Brown: I favour 4.

Greenwood: I favour 5.

Longford: I favour 4 — with the reservation that we shall never take up our option. [This is rather confusing, in that he was earlier noted as opting for 3.]

Griffiths: I too favour 4.

Wilson: There is a small majority in favour of 4. I will accept this decision, but it can be very badly misrepresented as a surrender to the US. Presentation is therefore very important. Use my redraft of the first paragraph of the annex to C(65) 58 [a memorandum by Healey calling for an option on the F-111], accept the second paragraph, omit the third paragraph, though complete those arrangements without publication in either country until we find it convenient. We should announce it in the Budget, with a full Ministry of Defence statement that evening, with script. If there is any change in the wholly non-committal nature of the option, the Cabinet must reconsider.



With that, the die was cast. The TSR2 programme would be cancelled and the option on 10 F-111s taken up, with a view to further procurement. Operational requirement OR343 was rewritten around the American machine, and come March 1966 a contract was

signed for those initial 10 aircraft, the plan being to order 40 more if authorisation was forthcoming by 1 April 1967. This was to involve the RAF-specific version of the F-111A, designated during 1966 as the F-111K. And while the use of Rolls-Royce Spey engines was rapidly discounted, certain offset deals relating to the F-111 order did go ahead. As Dr Richard Moore describes in a fascinating RAF Centre for Air and Space Power Studies paper, the US agreed to purchase salvage tugs from Lowestoft-based Brooke Marine, Handley Page's Jetstream twin-turboprop as a light transport for the US Air Force, aircraft carrier catapults and arrestor gear, and \$1.3 million-worth of barbed wire from Tinsley Wire in Sheffield.

But despite this — and the strong support of Denis Healey — the F-111K programme ended up mired in just as much wrangling and controversy as the TSR2. It was, fundamentally, down to the devalued pound and resulting budgetary pressures that January 1968 brought its acrimonious cancellation. Many of the same figures as had sat around the Cabinet table that day in April 1965, some now in different roles, found themselves involved in the often poisonous F-111K debates. That's a tale for another time. The result

was a further run-on for the Vulcan and a purchase of the Buccaneer S2, none of Hawker Siddeley's more advanced developments of the line having come to fruition. Having been dead-set against adopting a naval type, the RAF benefited from the 'Bucc's' sterling service for more than two decades.

Then there was the aftermath of the AFVG, the Anglo-French Variable Geometry aircraft project, which BAC took on after France withdrew in 1967 and — having brought in West Germany and Italy as new partners — eventually led to the Panavia Tornado. Now *there*, undoubtedly, was the right strike jet for the European NATO role both the TSR2 and the F-111K were increasingly earmarked for as cash-strapped Britain withdrew from military commitments 'east of Suez'. If something good came out of those Sixties sagas, this was it. Panavia, too, offered proof of how international industrial collaboration increasingly offered Britain's aerospace industry its future path. Perhaps those 1965 Downing Street decisions were indicative of a government beginning to understand the UK's true place in the post-war world, whether strategically or industrially, rather than one neglecting its defences and its aeronautical workforce.



BELOW: Having served with the Royal Navy, Buccaneer S2B XV350 was transferred to the Ministry of Defence and went on to undertake weapons development for the type's service with the RAF. ALAMY





CANCELLATION

“Cancellation was inevitable”

That was the verdict of a senior civil servant in the Air Ministry and the Ministry of Defence when he reflected on the demise of the TSR2. But could its fate have been different? A new assessment of how the project stumbled towards its end tells its own tale of a sorry saga **WORDS:** CLIVE RICHARDS





“**W**hen aviation historians of the future write nostalgically about the top twenty aeroplanes of all time, the TSR2 will almost certainly be on their list. At a time when many experts imply that we have seen the last of the manned bomber, it is not so much the one-after-the-last as the first of a new generation of aircraft of unprecedented versatility, accuracy and strike power.”

This prediction by John W. R. Taylor appeared in the December 1963 issue of *Air Pictorial*. He was not alone in lauding the new strike aircraft then being built by the British Aircraft Corporation for the RAF. In the same month, for example, *Aircraft Engineering* devoted some six pages to “the most advanced weapons system which the Royal Air Force has ever contemplated”. Acknowledging that its description of the TSR2 was “based on the minimum amount of hard fact and the maximum amount of conjecture”, the magazine looked forward to “some time in the not too distant future when the veil of secrecy can be lifted a discrete amount” and “it will be possible to deal with the magnificent combination of aeronautical and electronic engineering that

constitutes the TSR2 in the manner it so obviously merits.”

Nor was this acclaim limited to the aviation press. “The facts made public about TSR2 suggest that it is a remarkable engineering achievement”, wrote the defence correspondent of *The Times*, Alun Gwynne Jones — later ennobled as Lord Chalfont — in an article published on 4 December 1963. “Conceived as a replacement for

“The last months of 1963 had been a turbulent time for the TSR2”

the Canberra bomber to support ground forces in battle by long-range strike and reconnaissance, it seems to be technically equipped to penetrate enemy defences, to send back a constant flow of information and to attack targets accurately with conventional or nuclear weapons; unless there is some startling advance in defensive techniques it should be able to do so at least until 1980.”

Moreover, it appeared the project was now unstoppable. On 2 December, the *Daily Express* had included the aircraft in a list of five defence programmes a future Labour government “would find it impossible to abandon [...] without creating widespread unemployment and incurring heavy cancellation costs”. Two days later, Gwynne Jones struck a similar note. “Few people familiar with the facts of political life would suggest it is possible to abandon the project at this stage”, he argued. “It is, to adapt the memorable description of a distinguished Prime Minister, the best TSR2 we have”. Yet just 16 months later the new Chancellor of the Exchequer, James Callaghan, used his first annual Budget statement to signal the government’s intention to do just that. What changed? Why did the new Labour administration deem cancellation to be the best option?

“Australia should buy the TSR2”

The last months of 1963 had been a turbulent time for the TSR2. Despite significant design and manufacturing delays, it was announced at the end of August that BAC had been given the

ABOVE:
The first TSR2 in stage four of assembly in the Weybridge plant.

KEY COLLECTION

OPPOSITE PAGE:
Boscombe Down, the late afternoon of 27 September 1964, and TSR2 XR219 climbs out on its maiden flight, with Roland Beamont in command and Don Bowen as co-pilot. This took place just three weeks prior to the 1964 general election. BAE SYSTEMS



ABOVE: The end of the TSR2's initial flight, with braking parachute streamed, and BAC-operated Canberra B2 chase aircraft WD937 in attendance, coincidentally representing the main type the newcomer was due to replace. This sortie was trouble-free for XR219; subsequent ones, less so. ALAMY

green light to start acquiring long lead-time materials. On 21 October, the Ministry of Aviation further revealed that the production contract for an initial 30 airframes was in the offing. However, just two days after details of the contract negotiations appeared in British newspapers, an announcement on the opposite side of the world threw the TSR2's future into doubt.

By the middle of 1963, the question of acquiring an advanced strike aircraft for the Royal Australian Air Force had risen to the top of the political agenda in Canberra. One of the leading contenders was the TSR2. Hugh Fraser, the Secretary of State for Air, used a visit to Australia in September 1963 to press the case for the British aircraft. While

acknowledging that "this must be a decision for the Australians to take", on his return to the UK Fraser told reporters he was "very keen that Australia should buy the TSR2".

“ There was doubt in Australia as to whether the aircraft would ever fly ”

However, this was not to be, for on 24 October Prime Minister Robert Menzies informed the Australian parliament that the RAAF would acquire General Dynamics TFX

aircraft — later known as the F-111 — from the USA in preference.

The Australian decision to turn away from the TSR2 was all the more striking insofar as it had been the only aeroplane under consideration prior to April 1963. In a message sent to Prime Minister Sir Alec Douglas-Home on the same day, a copy of which is now preserved in the National Archives of Australia, the Australian premier outlined the factors behind this decision. Significant among these were the recommendations of an RAAF evaluation team that, between June and August 1963, toured the USA, UK and France to conduct "an on-the-spot evaluation of possible replacements of [sic] the Canberra in the strike/reconnaissance squadrons of the

RAAF". Such was the importance attached to the team's work that it was led by none other than the Australian Chief of the Air Staff, Air Marshal Sir Valston Hancock.

Although the team concluded that the North American RA-5C Vigilante offered "the quickest and most effective means of providing the RAAF with a strike/reconnaissance force", concerns were expressed that it was only an interim solution and "might itself need replacement before many years were out with more advanced aircraft", leading to its subsequent rejection. The Dassault Mirage IV and McDonnell Douglas F-4C/RF-4C Phantom were also set aside, leaving two aircraft "which would be good not only for the sixties, but would last well into the seventies": the TSR2 and TFX.

While conceding that "the TSR2 also met the air staff requirement better than any existing aircraft", Menzies noted that the evaluation team "assessed TFX as superior for our purposes to TSR2."



The selection of TFX was also driven by financial considerations. To secure an Australian order, on 3 October Douglas-Home's predecessor as Prime Minister, Harold Macmillan, offered the TSR2 at a unit price that excluded any margin for research and development expenditure. This "exceptional measure" meant Australia would "get the aircraft at the lowest practicable price and relieve you of worry on the score of development costs". It wasn't enough.

When Australian Minister of Defence Athol Townley visited Washington DC later that month he found "a real desire to meet us in every way" and came away with "an outstanding deal" on TFX. "It is in no way your fault that your turn-out of TSR2s is so very much less than the American make, but it results in the United States being able to offer their aeroplanes at a most substantially lower figure", Menzies told Douglas-Home on 24 October. "We haven't the figures yet to make exact comparisons, but it is, over the 24 aircraft, a matter of millions of pounds saving."

A third factor Menzies highlighted in his message to Douglas-Home was the importance of a TFX deal to US-Australian relations. "Although I have no doubt that the excellence

of the delivery and price terms owe a great deal to the talents of my colleague [Townley], there is more than an element of United States initiative in the transaction", he wrote. "By accepting it we do two things. We strengthen materially our own defensive power, and we add a good deal to the total free world capacity in this area. Further, we do it in a way which undoubtedly greatly satisfies the United States, and sustains their interest in this corner of the world."

"TSR2 will fall flat on its face"

In addition to the rationale laid out by Menzies, another issue may have influenced the Australian decision to reject the TSR2 — namely, doubt as to whether the aircraft would ever fly.

Senior Australian policy-makers had good reason to question the programme's future. "Although Sir George Edwards [BAC's executive director] personally conducted the Hancock team on their inspections and was adamant in posting a project cost of around £100M sterling for 24 aircraft, Hancock was sceptical", according to Harry Rayner's biography of the previous Australian air force chief, ACM Sir Frederick Scherger. "On the team's last evening in London Sir George asked what more could he do to

convince Hancock that the TSR2 was a serious project. The reply he got was that the RAF should be seen to be placing a firm order for 30 aircraft. Sir George replied that such an order could be expected within a fortnight. The order never eventuated, then or ever."

By this stage, the TSR2 had become a very political aeroplane. Many had begun to lose faith in the way service aircraft and missiles were conceived, designed and manufactured. In a review of post-war British military aircraft development published in the 19 December 1963 issue of *Flight International*, Bill Gunston, then the magazine's technical editor, was blunt. "The British taxpayer has paid roughly £3,000m for military aircraft and guided weapons since 1945. I doubt if anybody feels he has had good value for money". On Whitehall, influential figures such as Admiral of the Fleet Lord Mountbatten (First Sea Lord, 1955-59 and Chief of the Defence Staff, 1959-65) and Sir Solly Zuckerman (chief scientific advisor to the Ministry of Defence, 1960-66) questioned whether the TSR2 was necessary, especially given the promise of the Blackburn Buccaneer.

Their reservations were shared by some Members of Parliament. Although concerns had been expressed initially on both sides

BELOW: Afterburner is engaged on the Olympus B OI 22R (Mk320) engines at the outset of a test sortie. Both powerplants were replaced following the maiden flight, after which XR219 didn't take to the air again for more than three months. Vibration was causing shaft failures, and the second flight saw such serious vibrations that Beamont considered them unacceptable for further flying. Engine limitations remained in force for the whole of the flight test programme, deputy chief test pilot Don Knight later recalling that take-offs had to be made at circa 98 per cent power.

BAE SYSTEMS VIA
MALCOLM ENGLISH





ABOVE: The complex undercarriage was not retracted successfully until the TSR2's 10th flight. On the fifth, an attempt to do so could have resulted in Beamont and Bowen ejecting; the port main leg stuck down, and although both legs extended, the bogie beams were unlocked and in the vertical position. However, a successful — and very gentle — touchdown was made back at Boscombe, the beams rotating back to the horizontal.

BAE SYSTEMS VIA
TERRY PANOPALIS

of the House of Commons, by 1963 a sharp division had developed between Conservative enthusiasts and Labour sceptics. One of the latter, George Wigg MP, forecast on 5 March 1963, “the TSR2 will fall flat on its face. After an astronomical cost of £300 million or £400 million it will in due course be cancelled, and the Government will not dispose of one.”

The Australian decision fanned this already febrile debate. Labour politicians seized on the Australian decision as proof of how the project was wasteful and impracticable. Their Conservative counterparts, in turn, were quick to blame Labour for having put Australia off the aircraft. According to a report in *The Times*, during a visit to the English Electric plant at Preston on 8 November the Minister of Aviation, Julian Amery, “accused the Labour Party of undermining Australian confidence in the British TSR2 aircraft to such an extent that Australia decided to buy its

American rival”, and of having “served notice that, if returned to power, they would cancel the project.”

That evening the Secretary of State for Air used a constituency meeting to further defend the TSR2. “Much of what has been said”, Hugh Fraser asserted, “has been widely inaccurate and smacked all too strongly of that bad British habit of knocking anything British”. He continued to press the case for an RAAF purchase and claimed the aircraft was “a close parallel” to the Mosquito in terms of its ability to combine tactical and strategic roles in one airframe, “although of course it packs an immeasurably greater punch.”



Turning to the issue of price, he had “never seen so many wild and inaccurate statements. On any conceivable hypothesis the figures of total research, development and production costs — with or

without weapons — of £1,000m and a cost of £20m for each aircraft, which I have seen quoted on a number of occasions, are arrant nonsense”. The case for the aircraft, in his view, was clear. “We would be foolish not to adopt an aircraft which demonstrates supremely well the flexibility and the number of options available to air power. This is a challenge to which I believe the Labour Party are quite unable to find an answer.”

Ministerial efforts to rebut criticism of the TSR2's bottom line, however, were somewhat undermined by their inability to say with any precision just how much the final bill was likely to be. The various figures being bandied around in public at the end of 1963 were summarised by Alun Gwynne Jones in his 4 December article for *The Times*. Amery had “said that he will be astonished if the final cost exceeds a quarter of [Shadow Minister of Defence] Mr Denis Healey's nicely rounded

figure of £1,000m. The British Aircraft Corporation have a lower astonishment threshold; they put the final cost at about £225m.”

Gwynne Jones went on to offer his own estimate. Combining BAC’s research and development costing — which included the 20 trials aircraft — with the purchase of 100 service TSR2s at £2 million each, he suggested, “unless [...] there is some unforeseen difficulty the total cost of equipping the Royal Air Force with the new aircraft will be roughly £425m. There is no need to go in for any political multiplication to make this a very considerable sum of money.”

The minutes of the Cabinet Defence Committee, available at the National Archives, show Gwynne Jones was not far off the mark. Within the government, the cost — and cost-effectiveness — of the project had been questioned for some time. At the insistence of Chancellor of the Exchequer Selwyn Lloyd, approval for the issuing of a full development

contract in September 1960 had been conditional on “research and development costs and the probable final unit cost” being kept “under strict control,

and on the understanding that the size of the production order would depend on the outcome of a complete review of the Defence Budget at the appropriate time”. Despite this, costings put before the committee in June 1963 showed development expenditure alone was now expected to reach £200 million, almost two-and-a-half times the figure presented in 1960, while procurement was expected to add a further £300 million to the bill.

Moreover, the TSR2’s ballooning costs coincided with the need to bankroll several other funding commitments. In a paper circulated on 14 June 1963, Cabinet Secretary Sir Burke Trend identified four elements within the defence budget that could offer “substantial economies”: the Polaris nuclear submarine programme, army personnel numbers, particularly in Germany, the Royal Navy’s carrier replacement proposals and the aircraft associated with them, and the TSR2. None were

straightforward. In the case of the TSR2, he warned cancellation would rob the future RAF of “a medium range capability of reconnaissance and strike, whether with conventional and nuclear weapons; and we should be unable to support a purely British military attack against strong opposition in any part of the world. Can we afford — even allowing for Polaris — to take this risk, particularly so long as we assume that we remain committed to the defence of Europe against a conventional attack?”

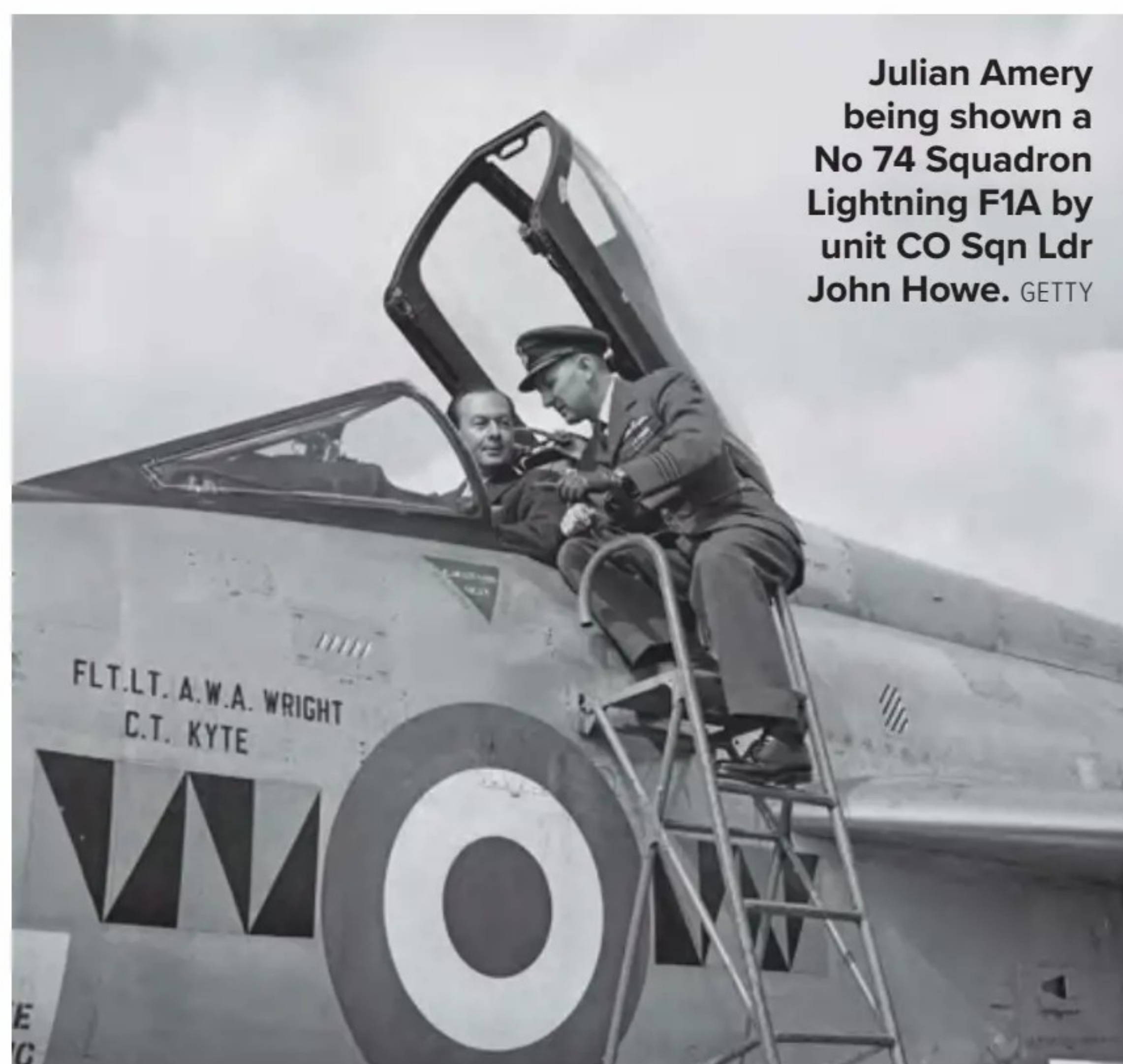
Rivals to the TSR2 in terms of funding could also be found within the Air Ministry itself. Senior RAF officers were becoming increasingly uneasy about the effect ever-increasing cost over-runs might have upon RAF procurement in the round. Earlier in the year, the Chief of the Air Staff, Marshal of the Royal Air Force Sir Thomas Pike, told the Cabinet Defence Committee,

“Senior RAF officers were uneasy about the effect of cost over-runs”

“replacement of the Hastings and Beverley by an up-to-date medium-range transport aircraft and the replacement of the Hunter fighter” were “the two most pressing

problems which confronted the air force at present.”

Although the preferred solutions were new, home-grown designs — in the case of the former, a new transport to meet operational requirement OR351, and the latter the P1154 — the Air Staff questioned whether the RAF could continue to ‘buy British’. According to T. C. G. (Cecil) James’s 1987 Air Historical Branch study *Defence Policy and the Royal Air Force 1956-1963*, in a paper presented to the Air Council in October 1963 Air Marshal Sir Wallace Kyle, then Vice-Chief of the Air Staff, argued, “we must give the most serious consideration to a change in policy whereby we buy our front line equipment from whatever source provides the most suitable equipment at the cheapest price. We cannot hope to maintain a reasonable front line if we are forced to go on supporting the British aircraft industry at the expense of the front line



Julian Amery being shown a No 74 Squadron Lightning F1A by unit CO Sqn Ldr John Howe. GETTY

WOULD THE TORIES HAVE CANCELLED TSR2?

Labour’s 13-seat majority following the 1964 General Election was won on a vote of 12,205,808 — just 203,166 more than their main opponents. Had the result been reversed, could similar considerations as those expressed by Jenkins have swayed a renewed Conservative government?

Although their manifesto did not commit the Conservatives to retaining the TSR2, the political capital already invested in the aircraft by the previous administration would have made cancellation a very difficult pill to swallow. At a press conference held just three weeks before the election, Julian Amery insisted Denis Healey’s costings were “wildly mistaken” and reassured the assembled journalists that he and his colleagues retained “full confidence in the TSR2 and are developing nuclear and high explosive weapons appropriate to it”. Reversing such a long-held position would have vindicated their Labour critics and could well have risked a backbench revolt, which might have been especially problematic if the new government could command only a small majority in the House.

Axing the TSR2 was therefore easier for Labour ministers to contemplate than it would have been for their Conservative counterparts. Nevertheless, in private many senior Conservatives would appear to have viewed the project’s spiralling costs with trepidation. Moreover, any new Conservative government would have been faced with the same burgeoning balance of payments crisis that confronted incoming Labour politicians. With the cost-effectiveness of pursuing TSR2 in preference to a rival US design open to question and the economy under mounting pressure, a Conservative cabinet might have found it difficult to maintain its predecessors’ commitment.



ABOVE: Three days after the Budget speech that announced the TSR2's demise, BAC workers and family members protest during an open-air meeting at the Strand Road, Preston works. "Don't Blame Labour for Wilson" is a common slogan.

GETTY

of the Royal Air Force. Equally, I suggest that for most major new projects the only practicable alternatives open to us will be either to buy abroad or to limit major developments to those done in concert with our allies, despite the difficulty of reconciling operational requirements.”

“TSR2 will play a very big part in our defence”

Regardless of such concerns, the TSR2 seemed too deeply entrenched in the defence programme to be at risk. "The main decisions with which we are faced immediately are whether to embark upon a carrier replacement programme and whether to press on with the aircraft and guided weapons projects currently envisaged", Minister of Defence

Peter Thorneycroft argued on 2 July 1963. "I regard the TSR2 as over the dam for political reasons if no other". At the end of October, an unnamed "Air Staff member" assured the long-standing aeronautical correspondent of *The Times*, Arthur Narracott, "TSR2 will play a very big part in our defence for the next 10 to 15 years and, I feel personally, longer than that."

The Statement on Defence put before Parliament in February 1964 was similarly optimistic. The TSR2 represented the “most notable example” of the RAF’s place at “the forefront of technical progress”, it enthused. “This aircraft promises to be one of the most potent and flexible instruments of military power yet devised and should have a long and effective life. Twenty development and pre-production aircraft are on order and

negotiations are in progress for a production order of 30 aircraft."

Nevertheless, that year would see no let-up on either the rising development costs associated with the TSR2, estimated at £240-260 million in January 1964, nor pressure on the public purse. Such was his concern that the Chief of the Air Staff, ACM Sir Charles 'Sam' Elworthy, "after discussion with a very limited circle, took a note from himself to the Secretary of State for Air [Hugh Fraser], who showed it to Thorneycroft expressing doubts about the project. The paper was torn up and CAS told that this was not a matter to be discussed before an Election."

Neither party's manifesto going into the 1964 General Election made direct reference to the TSR2. Indeed, the Conservative manifesto featured little mention



In the assembly hall at Weybridge, one TSR2 — probably XR219 — is nearing completion and its move to the final assembly area, while three forward fuselages are being worked on and other airframes are under way in the background. KEY COLLECTION

of conventional weapons at all, beyond noting that they took up more than “90 per cent of our defence effort”. By contrast, Labour took a broad swipe at the government’s handling of military aircraft development and procurement. “Many thousands of millions have been spent on the aircraft industry”, it observed, “but because of lurches in strategic policy, wrong priorities, and grave errors in the choice of aircraft, we are now in a position where obsolete types have not been replaced, and for such urgently needed machines as helicopters (which could make a great contribution to the security and effectiveness of our troops in Malaysia) we are dependent on the United States.”

Following the election, the incoming Labour government

TSR2 FOR THE LUFTWAFFE?

In the wake of Australia’s rejection of the TSR2, the British government sought other potential international buyers for the aircraft. One such approach involved West Germany. At the end of May 1964, the Defence and Overseas Policy Committee “agreed that the Federal German Minister of Defence, Herr [Kai-Uwe] von Hassel, should be invited to inspect the TSR2 aircraft during his visit to the United Kingdom and that German technical experts should subsequently be allowed to examine it in more detail”. When the matter went before the Cabinet on 4 June, it concluded, “it seemed to be in our interests that we should be willing to sell the TSR2 aircraft to the Federal German Government”. In the event “that the Federal Government were disposed to buy the aircraft”, the Secretary of State for Defence was directed to refer the

request back to the Cabinet for further discussion.

The deafening silence that followed suggests this was wishful thinking on the British side; there would seem to be no evidence the Luftwaffe ever really intended to acquire the TSR2. The absence of such sales meant all the research, development and production costs in relation to the aeroplane were borne by the UK alone. In an article published less than two weeks after the 1964 election, a ‘special correspondent’ in *The Times* questioned “the wisdom of continuing to compete with America in the production of extremely expensive prestige aircraft — such as the Concorde, the VC10, and TSR2 — with a small home market and only a slim chance of selling them abroad in sufficient numbers to make the projects economically worth while.”

BELOW:
The three forward
sections of XR221
having just been
mated. Road-
transported from
Weybridge to Wisley,
this ended up being
the only TSR2 to
have the avionics
fit incorporated and
ground-tested.

KEY COLLECTION

conducted “an initial review of our defence and overseas commitments” and Prime Minister Harold Wilson reported the results to the Cabinet on 26 November. “The United Kingdom was attempting to discharge three major defence roles — a commitment to the defence of Europe under the North Atlantic Treaty Organisation (NATO); the role of a nuclear power, which the Government had inherited from their predecessors; and the maintenance of a world-wide military presence; based on our overseas commitments”, Wilson reminded his colleagues. “The resultant burden on our economy made it impossible for us to sustain all three roles indefinitely; and it would be necessary for the Cabinet to consider on a subsequent occasion, when more detailed proposals had been formulated for the purpose, both a revision of the scale of our overseas commitments and the possibility of effecting corresponding reductions in the relevant weapons systems, particularly certain very costly aviation projects.”

The “subsequent occasion” came on 1 February 1965. The sixth item on the agenda for that day’s Cabinet

meeting was “Defence Economies: Aircraft”. Once again, the Prime Minister led off by sharing the results of the Defence and Overseas Policy Committee’s “examination of the defence aircraft programme”. The results were stark. Although the RAF should “adopt the Comet as a replacement for the Shackleton II”, it was nevertheless agreed that both the P1154 and HS681 should be culled. “In place of the P1154 it was proposed to buy a limited number of United States Phantom aircraft and, at the same time, to develop the P1127”. Similarly, rather than the HS681 the UK would purchase the Lockheed C-130 Hercules, “which would adequately meet the operational requirements involved” and “only cost one-third as much by aircraft.”

***“The TSR2 is costing us
£1 million a week”***

That left the TSR2. “This aircraft had originally been estimated to cost a total of £325 million (including £90 million in respect of research and development), i.e. an average cost for 158 aircraft of £2.1 million. This estimate had now risen to a total of £750 million or approximately

£5 million per aircraft, an increase which illustrated the uneconomic character of the manufacture of military aircraft in the United Kingdom”. Given how cancellation “would clearly create both political and industrial problems”, consideration was given to a “compromise solution, whereby only 50 TSR2 would be ordered together with an equivalent number of United States TFX aircraft”. However, this was deemed “both uneconomic and impracticable from the operational point of view”. While recognising that purchasing the TFX in lieu of the TSR2 would necessitate “substantial dollar expenditure”, this would be alleviated by the “generous financial terms” extended by the US government, “which would substantially alleviate the burden of our balance of payments.”

Fundamentally, the committee acknowledged both the TSR2 and TFX “were still subject to considerable uncertainties”. It recommended, “research and development in relation to TSR2 should be allowed to continue for a further few months at a cost of £4 million a month, and that the final decision should then be





taken in the light of the additional technical information about both aircraft which would become available during the interval, the more detailed assessment of the economic implications of cancelling the TSR2 which would now be put in hand and the results of the comprehensive review of our defence requirements which was already in train.”

Two months later, on 31 March, Denis Healey — now Secretary of State for Defence — submitted to the Cabinet a memorandum summarising the investigations undertaken during the intervening period. “We now have the information on which to reach a decision”, he asserted. “The TSR2 is costing us £1 million a week — £20 million since we assumed office. I believe we should now cancel it and take an option on the F-111A — the United States Air Force version of the TFX.”

As described in the preceding article, the Cabinet convened the following day to consider three interlinked questions: should the TSR2 be cancelled; if so, would it be necessary to acquire a replacement; and should that replacement be

the F-111A? Although concern was expressed as to the effects cancellation might have on the UK aviation industry, economic factors nevertheless weighed heavily against the British aircraft. Opinions were divided as to whether it was necessary for to commit immediately to a surrogate — and whether that should be the F-111A.

“Both TSR2 and TFX were still ‘subject to uncertainties’”

After spending some time revisiting earlier arguments, any decision was deferred to a second meeting at 22.00 that night. Once the cases for and against both aircraft had been aired, it fell to Wilson to sum up the mood of those around the table. In his judgement, Healey had won the day. The Cabinet’s preferred course of action was “to cancel the TSR2 and to

secure an option on the TFX, on the lines suggested by the Secretary of State for Defence. Before a final decision could be taken in this sense it would be necessary that the terms of the option agreement should be confirmed by the United States authorities, particularly that it involved no commitment at this stage to purchase any TFX. Subject to this condition the Government’s decision to cancel the TSR2 might be announced by the Chancellor of the Exchequer in his budget speech on 6th April.”

A prize albatross?

“In the ten years since 1954 the United Kingdom has produced only one ‘big league’ weapon: TSR2”, asserted Bill Gunston in December 1963. He went on to attribute the continued survival of this “wonderfully flexible weapon” to nothing more than “dogged persistence. A decade of shilly-shallying has almost made us in Britain believe that the development of a modern military aircraft is beyond our capabilities. It comes as a surprise to appreciate the fact that we have actually created

ABOVE: The second aircraft, XR220, had to be repaired after literally falling off the back of the lorry which delivered it from Weybridge to Boscombe Down in September 1964. Once this was done, it was assembled in the hangar used by the TSR2 test team, but was never destined to fly.

BAE SYSTEMS



ABOVE: The last TSR2 flight to both start and finish at Boscombe was the 13th, on which sortie this image may have been taken. BAE SYSTEMS VIA MALCOLM ENGLISH

one, simply because nobody has succeeded in getting it cancelled."

In April 1965 the new Labour government did just that, sparking a torrent of criticism that has continued to this day. In his 1970 R. K. Pierson Memorial Lecture to the Weybridge branch of the Royal Aeronautical Society, the Chief of the Air Staff during the opening stages of the TSR2 story, Marshal of the Royal Air Force Sir Dermot Boyle, drew a clear lesson from the cancellation: that "the provision of vital operational equipments [sic] for the Royal Air Force is too serious and obviously much too difficult a matter to be left to the politicians."

However, the requirements of service cannot be the only yardstick used to judge aircraft procurement decisions, and especially in peacetime. This was reflected in comments made by Minister of Aviation Roy Jenkins to the House of Commons on 13 April 1965. Jenkins conceded that the TSR2 "was a fine technical achievement. It was an advanced

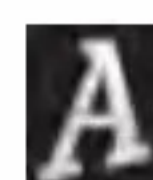
aircraft. It handled well in flight, and it was a tribute to many of those who worked on it. There is nothing technically wrong with this or any other British aircraft". Nevertheless, he argued, "aircraft projects must be more than this. They must have controllable costs; they must fulfil

“ Roy Jenkins said it was ‘not a prize project, but a prize albatross’ ”

the country's needs at a price that the country can afford; they must be broadly price competitive with comparable aircraft produced in other countries, and they must have the prospect of an overseas market commensurate with the resources tied up in their development. On all these four counts I regret to say that

the TSR2 was not a prize project, but a prize albatross."

Perhaps the last word on the TSR2's demise should go to Sir Frank Cooper. A wartime RAF pilot, Sir Frank joined the civil service in 1946 and held a series of senior appointments in the Air Ministry and later the Ministry of Defence prior to his retirement in 1982. As Assistant Under Secretary (Air) between 1962 and 1966, he had a ringside seat for the discussions that took place within both Conservative and Labour governments as to the merits and eventual fate of the TSR2. "Major defence changes are rarely the result of internal policy initiatives", he reflected at an RAF Historical Society seminar on the TSR2 at Filton in 1997. "They stem in the main either from external influences or from economic and financial factors. It was these factors that broke the TSR2's back". Sir Frank's final judgement was stark. "An extraordinary and complex story. Cancellation was inevitable."



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TSR2 SPECIAL



FATES

Seldom has the RAF Museum's TSR2, XR220, looked more dramatic than when it took part in a 2020 night shoot outside Cosford's National Cold War Exhibition. ALAMY



TWISTS

So high did emotions run in the wake of the TSR2's cancellation that the fates of the completed — or near-completed — airframes were the subject of questions in Parliament. In the end, the survival of two wasn't bad going **WORDS:** BEN DUNNELL



OF FATE

RIGHT: Intended to undertake navigation and attack trials before moving on to radio work, XR226 wasn't one of the lucky ones. Ending up about 90 per cent complete, it was broken up outside the Weybridge plant.

BAE SYSTEMS

BELOW RIGHT: The Cranfield Institute of Technology wanted a TSR2 as an up-to-date teaching aid, and received XR222. As of this September 1966 open day, it had been there for just under a year.

DAVID WHITWORTH



Where did the idea originate that the immediate scrapping of so much to do with the TSR2 formed part of some grand political conspiracy against the aircraft and the British aviation industry? To this day, long after many well-researched and referenced sources have debunked the notion, it continues to be repeated ad nauseam. Countless times, it's pointed out that the procedure whereby the semi-complete airframes, components, jigs, documentation and other items were rapidly destroyed was part of a regular procedure in such circumstances, while other evidence describes how the government would have been perfectly happy to see BAC continuing to use XR219

and XR220 for limited research flying towards other programmes, just so long as the manufacturer footed the bill. Yet still the old canards endlessly rear their head.

They certainly date back a long way. As early as February 1967, Conservative MP John Boyd-Carpenter was asking the Minister of Aviation, "whether it was a condition of the payment of compensation for the cancellation of the TSR2 aircraft that the prototype aircraft and jigs should be destroyed". John Stonehouse replied, "No, Sir", adding how the bit about the prototypes was simply untrue.

The following year, another Tory member, Lt Col Sir Walter Bromley-Davenport told the House of Commons, "in the opinion of the aircraft industry and many people

outside it, the destruction of these tools was a deliberate action to stop any future Government from continuing the project", adding, "Is that not sabotage on the grand scale?" The minister told him he was, "completely wrong. The space at the firms concerned was required and the jigs therefore had to be removed or destroyed. The honourable member's attempts to breath fire and brimstone into this very stale old controversy will not succeed."

With hindsight, the 1968 debate was an interesting one, for Cranley Onslow — a future aerospace minister in a Conservative administration — asked Stonehouse, "if he will arrange for the TSR2 airframe at present located at Shoeburyness to be transferred to the Science Museum". This was XR219, the sole flyer, which had been transported from Warton to the Proof and Experimental Establishment (P&EE)'s Shoeburyness range on the Essex coast in August 1966 for what were described as "vulnerability and lethality trials". There it joined XR221, the third airframe and the last to be completed. XR219 was selected because the plan was to fire weapons at it with the engines running, though this never transpired.



"Is it not a fact", Onslow thundered ineffectually, "that the so-called ground tests at Shoeburyness consist of using the aircraft as a target? Despite the minister's guilty desire to destroy all trace of the TSR2, is he aware that it would be more to the nation's benefit if this product of British engineering were displayed where people could see it?" Stonehouse responded, "The present government are more concerned about the future than in trying to rake over the dying embers of the past. As for the research work on this aircraft, it is extremely important to

BELOW: While XR219 was never destined to leave Shoeburyness, it was reassembled there and made more complete, probably through the use of components from other TSR2 airframes. Behind it here is believed to be Bristol 188 XF926, the example of the supersonic research aircraft that survived.

TERRY PANOPALIS COLLECTION



gauge the vulnerability of advanced aircraft to missiles that may be used against them in future.”

John Stonehouse would, of course, go on to achieve a level of notoriety almost on a par with that of the TSR2. His decision in the face of financial difficulties to try and fake his own death, and later revelations that he was an agent for the Czechoslovak secret service, guaranteed this fairly insignificant government minister a place in the history books he otherwise would never have warranted. In a similar way, what survived from the TSR2 programme into preservation — two complete aeroplanes, neither of which flew, a trials nose section and various other components — is wildly out of proportion to the aircraft’s career. As newly discovered correspondence shows, had different decisions been taken, a third aircraft would probably be around too.

Given the level of fascination that still surrounds everything TSR2, it’s easy to forget how there was a time when the project’s most substantial relics could barely be given away. Just as today’s newspaper transitions into tomorrow’s fish and chip wrapping, so the great white hope of British military aviation rapidly became yesterday’s article.

Never completed on the Weybridge line, fourth aircraft XR222 went in 1965 to the then Cranfield Institute of Technology as a ground instructional aid, and from there during 1978 to the Imperial War Museum at Duxford, where it can still be seen — as far more of a finished product than ever it was in period. As for XR220, which so nearly took to the air on the day the programme was cancelled, its useful life concluded with a series of ground-running Olympus engine noise tests in support of Concorde development. The Ministry of Aviation sought to offload the aeroplane to all sorts of organisations, among them the Empire Test Pilots’ School, the Royal Aircraft Establishment and the Royal Radar Establishment. None wanted it. The exception was the RAF’s Air Historical Branch, and in June 1967 XR220 was duly taken by road to Henlow for storage, awaiting the day a museum could take delivery. That’s how it ended up in what today is called the RAF Museum Midlands at Cosford.

But what of XR219? There was, it now emerges, a brief — if vain — effort to bring this significant



specimen into the preservation orbit. Leslie Hunt, one of the earliest chroniclers of the UK’s aviation heritage scene, wrote to the nascent Newark Air Museum in late 1969. He suggested, a set of minutes says, “that a letter be sent to the Ministry of Technology re the Bristol 188 and TSR2 at Shoeburyness Range, due to be vacated shortly”. This was because part of the site fell within the area selected for London’s intended new offshore airport at Maplin Sands.

“ There was a brief effort to bring XR219 into preservation ”

The ministry’s reply suggested a further letter to the P&EE, since the airframes were in its ownership. Eventually, in January 1970, a reply was recorded by the museum. It explained how both aircraft “were required until the foreseeable future irrespective of whether the establishment moved on or not”. And that was that. At least it did prove possible to save one of the two Bristol 188s that had been dumped

on the range, XF926 being rescued by the RAF Museum in 1972, while sister machine XF923 was scrapped. More than half a century later, the RAFM no longer deems this spectacular testbed worthy of public display. Plus ça change. But we digress. It does, at least, continue to offer XR220 a secure home.

The Maplin Sands airport was never built, and the P&EE carried on firing things at XR219. Taking part in yet another Commons debate, this time in June 1968, Cranley Onslow had declared, “a Conservative administration would not allow this aircraft to be destroyed...” It was a hollow claim. His party was returned to power from 1970-74, and again in 1979 for 18 years, yet this TSR2 was destroyed. An RAFM attempt to acquire XR219 in place of XR220 also foundered, and its mortal remains were finally scrapped at Shoeburyness in 1982.

There was one other idea for the aircraft. Addressing the Commons in 1968, Labour MP Ronald Atkins suggested that the government “consider transferring this airframe to the Tory headquarters at Woking” — Cranley Onslow’s constituency — adding how it was “an aeroplane which the Tories would themselves have cancelled”. Given how the TSR2 was so inherently political, maybe this wasn’t the silliest proposal.



ABOVE: Only since IWM Duxford’s AirSpace building opened in 2006 has XR222 enjoyed permanent indoor accommodation, and prior to that the aeroplane was given a very thorough restoration. ALAN WILSON

With thanks to the Newark Air Museum’s Howard Heeley and due acknowledgement to Andrew Simpson, formerly of the RAF Museum.



Working Watts

Two brothers, inured to Canada's wilderness flying, signed on as civilian aircrew with World War Two's RAF

Ferry Command. Howard and Bruce Watt turned their bush piloting skills to long-range deliveries of aircraft far larger than anything either had ever experienced **WORDS: ROBERT S. GRANT**

TOP: In 1912, Howard Watt towered above Bruce. Few family members, including sister Rhoda (left), would have predicted aviation careers for the brothers, who had been destined to enter the family milling business.

WATT FAMILY

As Curtiss JN-4 'Jenny' G-CADW slammed into the crust-covered ice on 26 March 1926, the crack of its collapsing landing gear penetrated the boreal forest. Extricated from the wreckage and taken to a hospital in Sioux Lookout, 233 miles east of Winnipeg, pilot Howard Watt moved on two days later for recovery at his Toronto home. Born on 21 May 1900, the undaunted adventurer suited very well the risk-taking role of stereotypical bush pilots confronting

ruthless coniferous jungles and short-plant tundra.

At the age of 16, Howard had joined the Canadian Expeditionary Force for overseas service without parental permission until authorities promptly sent the under-age miscreant home. A year later, he bluffed entrance into the Royal Flying Corps long enough to learn to fly before sharp-eyed officers pounced upon a falsified birth certificate. On the road again, he supported himself as a fast-talking

salesman-shipper in a family milling and feed business. Still entranced by aviation, he flew whenever it was possible and had earned commercial pilot's certificate number 214 by 2 March 1926.

Although inexperienced, the aviation-addicted Howard talked his way into the Curtiss JN-4 with Jack V. Elliot Air Service of Hamilton, not far from Toronto. While Howard's brother Bruce Watt, eight years younger, watched, company owner Elliot dispatched the older



The vibration-inducing Hall-Scott engine on Howard Watt's Standard J-1 necessitated constant maintenance. One critic claimed the aircraft always played "second fiddle" to the ubiquitous Curtiss JN-4 and could not survive northern operating conditions. VIA DIANA TRAFFORD



On 15 September 1926, federal authorities registered Howard Watt's Standard J-1, G-CAFT, with a 165hp Hall-Scott engine. The all-wood J-1 entertained 25,000 spectators in August 1927 with 'Daredevil Bobby Irwin' wing-walking and parachute-jumping. After Watt's meeting with electric power lines, the aircraft went to Toronto Airways and soon was "condemned and struck off register." VIA D. LONG



Howard and daughter Gloria prepare G-CAFT for flight. In later years, Gloria qualified for a commercial pilot's licence but decided not to pursue aviation for a living. VIA DIANA TRAFFORD



Pilots such as Howard Watt flew from Curtiss JN-4 G-CADW's rear seat. RED LAKE REGIONAL HERITAGE CENTRE

Only one Ryan M-2 operated in Canada. Powered initially by a 180hp Hispano-Suiza, Howard Watt installed a 200hp Wright Whirlwind. Underlined registrations indicated privately owned aircraft. Although the Watts carried passengers and flew freight loads, the aircraft never received type approval north of the US border. AVIALOGS



Bruce watched Ryan M-2 G-CAJK drift out of sight into the Atlantic Ocean after his forced landing on ice on 29 February 1932. CANADA AVIATION AND SPACE MUSEUM



Howard Watt began flying Fairchild FC-2W2 G-CAIW for Transcontinental Airways at \$250 monthly and five cents per flying mile in January 1929. CANADA AVIATION AND SPACE MUSEUM



sibling to Hudson, near Sioux Lookout. Elliot expected his acolyte to haul fuel cans and mailbags with prospectors in underpowered JN-4s during a winter get-rich-quick gold rush. Howard's foray ended when the ski-equipped 90hp aircraft stalled in a climb through descending air. Elliot tried to convince a court that his pilot suffered brain blackouts. The three-member board did not buy the insurance-avoidance scheme and concluded, "blame could not be attached to anyone."

Fractures healed and stitches removed, Howard purchased a 175hp Hall-Scott-engined Standard J-1, c/n 400, on 15 September 1926 and anticipated nestling it among the aeroplanes of southern Ontario. He might have realised his goal had G-CAFT not introduced itself to power lines near Gravenhurst, north of Toronto. Howard contemplated his next move.

The Manitoba Basin Mines conglomerate had formed Eastern Canada Airways to support field parties and engaged him as operations manager for a 1927 Ryan M-2, G-CAJK, manufactured by B. F. Mahoney Aircraft which had also crafted Charles Lindbergh's NYP. Naturally named *Spirit of The Pas* for its base in The Pas, Manitoba, the privately licenced conveyance stayed with the organisation until being sold on 12 June 1928, whereupon Howard sought new employment.



He went to work with Quebec City-based Canadian Transcontinental Airways, whose air mail contracts along the St Lawrence River to the Gulf of St Lawrence kept him busy. Many flights involved landings at places such as Pointe-au-Père on the river's south side. Hove-to ships, like the *Empress of France*, offloaded mail for transfer by boat to Howard's aeroplane. Winter charter and mail delivery demanded exceptional skill when cliffs rolled up to the shorelines, year-round fog tested patience, and gales eroded rooftops. Lack of landing space caused pilot-mechanic teams to air-drop loads on the north shore and, occasionally, weather forced overnights with cold-soaked engines and thawing body parts. Like many Depression-era pilots, slowdowns and cutbacks resulted in dismissal notices and Howard's arrived on 30 May 1930.

Bruce earned his commercial pilot's licence on 10 October 1930



LEFT: Howard Watt enjoyed flying Fairchild 71 CF-AAT from Quebec City on St Lawrence River mail routes to Anticosti Island in the Gulf of St Lawrence. Built in 1929, the Wasp-powered ski-plane had a skylight emergency exit should the aircraft break through ice.

LIBRARY AND ARCHIVES CANADA

and began paralleling his sibling. Although they rarely crewed together, their backgrounds in enduring adversity became assets in approaching world conflicts neither could have foreseen. After Howard bought the same Ryan M-2 he had managed in Manitoba, Bruce joined his brother. The federal Department of Transport was not pleased. "It is of a type which has never been accepted in Canada and it is a poor example of that type", reported the DoT's A. T. Cowley. "It was examined by this writer some years ago when it was decided it could not be licenced commercially."

Many quasi-legal trips took place since the 180hp Hispano-powered Ryan M-2 had not been awarded Canadian type approval or been commercially licenced. Howard switched to a Wright J-4B and on 29 February 1932, engine failure brought Bruce down near Matane, 252 miles north-east of Quebec City, while crossing the St Lawrence River. He and three passengers had no desire to float into the Atlantic on rafts of ice and jumped from floe to floe until a rescue rowboat reached them. Currents negated any efforts at salvage and the ski-equipped *Spirit of The Pas* floated away forever.

Canadian Airways, which assumed ownership of Canadian Transcontinental Airways, hired Howard for a 1,056-mile charter from Montreal to Cape Smith on the eastern Hudson Bay with Fairchild FC-2W-2 G-CAIW, in company with pilot Kenneth Saunders in Junkers W 34 CF-ATF. Both of these high-time "Pilots of the Purple Twilight", as author Philip H. Godsell so memorably described the breed, staged to the desolate Cree village of Moosonee on James Bay before proceeding along the coast in temperatures as low as -32.5°C (-26.5°F) to a Cyril Knight Prospecting Company base camp.

Snow obscuring the rock-slab tundra converted maps into useless sanitary tissue and magnetic variation rendered compasses unreliable. Savage cold seared the hands of mechanics Charles Palaisy and wireless operator O. C. S. Wallace. The short daylight led to stops at Hudson's Bay posts where the team dragged out blow-pots to pre-heat oil. Long nights in canvas tents shrouded by ice and snow

“ They pleased locals by replacing dog-sled trips with three-hour hops ”

enhanced the patience Howard would one day need to survive VLR, or very long-range, trips.

At Cape Smith, the team landed their clients with tents, provisions and a portable assay furnace. Their goals attained, Howard and Saunders pointed south with malodorous fox fur and seal-skin bales for the Hudson's Bay Company crowding their cockpits.

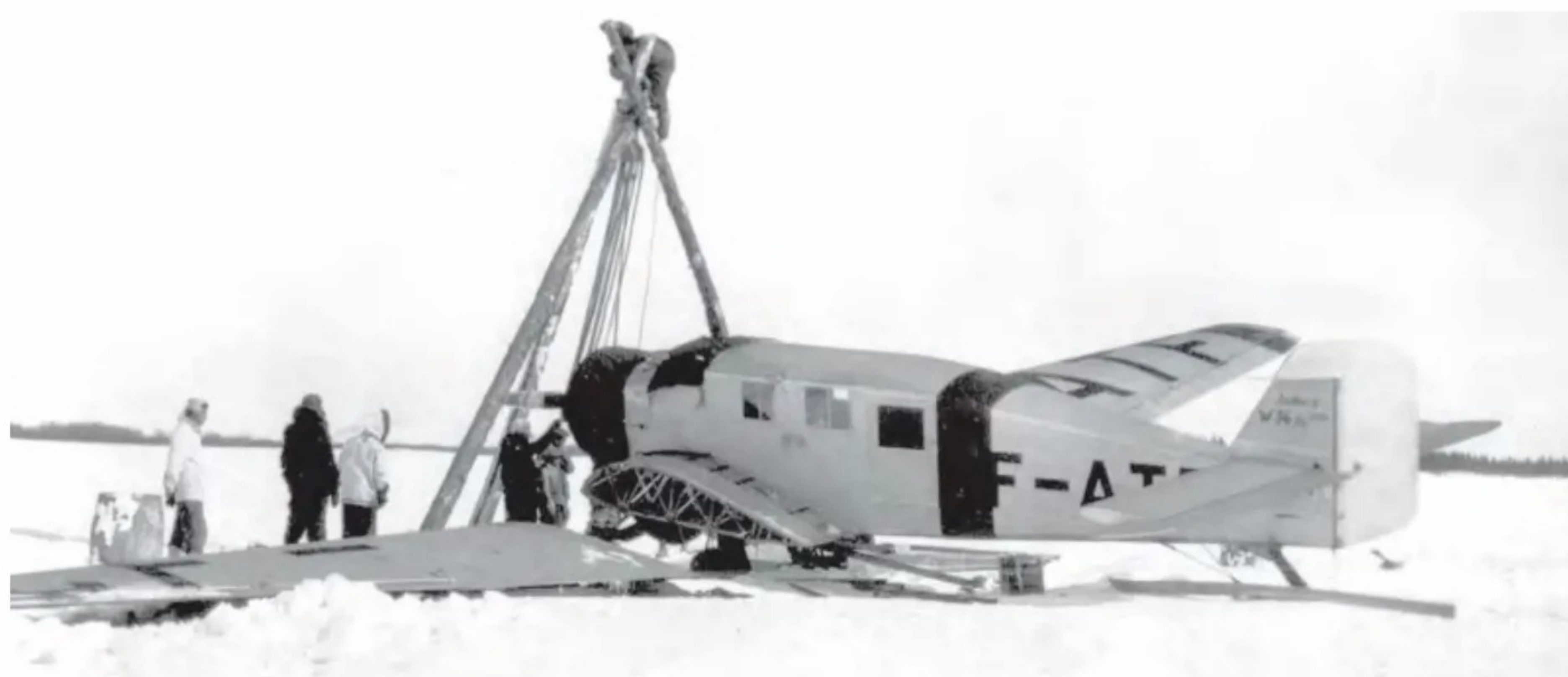
After penetrating ice crystal fog and navigating guessed headings, a white-out landing disabled the W 34 and Howard's FC-2W-2 became the Junkers' parts transport. The epic concluded at St Hubert on 12 April 1933 where the *Montreal Gazette* clarified, "Both pilots were very modest in describing their experiences."

As the Depression lingered, the company struck Howard from the payroll for "reasons of economy". To survive, the brothers created Service d'Aviation Matane/Côte-Nord with leased Fairchild FC-2W-2 G-CANB for short-term winter work on skis. Inspired by surveys he conducted for the Clark Steamship Company, Howard partnered with forest engineer T. B. 'Happy' Fraser in de Havilland DH83 Fox Moths CF-ATV and CF-ATX to announce the founding of St Lawrence Airways during January 1935. Transporting everything from dog food to expectant mothers, they pleased the local residents by replacing spine-shattering three-week dog-sled trips with three-hour hops.

Understaffed authorities could not pursue every missing logbook signature or unweighed box of biscuits. Almost without exception, hinterland pilots did what

BELOW: When incidents occurred such as this one to Junkers W 34 CF-ATF, mechanics and pilots used whatever came to hand for salvage.

CANADA AVIATION AND SPACE MUSEUM





ABOVE: Howard Watt's North Shore Airways received authorisation on December 1937. DH84 Dragon II CF-AVI cost \$11,500. After three years in service, a tornado turned the aircraft to kindling on 13 January 1941.

VIA DIANA TRAFFORD

conditions dictated to get the job done. Resourceful and prudent, they saved lives and sometimes lost their own but without the discipline and spirit of these aerial artisans, northern development would have been far more laggard. In the Watts' case, the DoT had little choice except to stand by and monitor night flying, overloading and incorrect paperwork. Daylight-only cross-river flights became an issue. Regulations demanded altitudes high enough that aircraft could reach land in the event of engine failure, and inspectors knew loaded Fox Moths with 120hp Gipsy III engines could barely out-climb dandelion fluff on dead-calm days.

"On December 25, 1936, pilot Howard Watt took off from Trinity Bay with three passengers on board and landed in Matane Lake after a 40-minute flight", reported assistant inspector J. L. Blondeau. "The straight-line distance is 41 miles. Assuming a maximum gliding ratio with 'dead stick' of 5 to 1, the aircraft would have to be 17,054ft when over the midway water point."

Blondeau suggested the Fox Moths carry barographs but the device calibrated only to 5,000ft. Bruce responded to questions of overloading by stating that small-stature French-Canadian passengers averaged 150lb (68.03kg) instead of the standard 180lb (81.6kg). The DoT dropped another charge when

“He applied his exceptional know-how to flying across the oceans”

Howard explained how static-filled telephone communication and language problems led to the confusion of 'seaplane' for 'ski-plane'. Aircraft on floats were always heavier.

A heater fire on 18 September 1937 forced CF-ATV onto river rocks. Assessed as being damaged beyond repair, it never flew again. Howard

assumed CF-ATX's ownership, but then sold the Fox Moth on 8 March 1940, and Fraser migrated to manage a paper company. Howard invested in another new business called North Shore Airways with de Havilland DH84 Dragon II CF-AVI. In spite of stone-weighted planks across the skis and wings roped to full fuel drums, a tornado ripped the aircraft loose on 31 January 1941. That 70mph wisp of wind, as historian Diana Trafford wrote, "effectively shut down North Shore Airways."

As World War Two absorbed almost every licenced pilot in Canada and hundreds from the United States, the Watts decided to do their share and transitioned to medium and heavy multi-engine platforms for what became Royal Air Force Ferry Command, later subsumed into Transport Command. Bruce signed on as a civil ferry pilot on 14 November 1940 while Howard did the same on 30 March 1942. Both underwent familiarisation with Lockheed Hudson IIs in Montreal.

An acquaintance described Howard, but the words applied to both brothers: "His air sense, cool daring and good judgement enabled him to apply what he had learned from coaxing those early crates into obedience along the St. Lawrence [...] and to apply this exceptional know-how to the business of flying Mitchells, Bostons and Baltimores across the oceans."

As co-pilot on what would have been his initial ocean crossing, Bruce boarded Hudson III T9446 at Gander, Newfoundland, on 28 December 1940 for the 2,200-mile flight. The 65ft 6in (19.96m) wing and the power of 1,200hp nine-cylinder Wright R-1820s exceeded anything he had flown. Awed, not intimidated, he performed pre-flight duties as Capt V. Edward Smith completed cockpit checks in the commodious zinc-chromated cavern of the Hudson. They felt the Wrights rumble with Hamilton-Standard propellers turning 2,500rpm and blue smoke blating from the Inconel exhausts. Instead of a typical 'wheels-in-the-wells' straight-out departure, the Hudson rolled left, a wing struck the surface and propellers chewed into tarmac before thumping into a ditch. The fuel ignited but the three-man crew escaped. Officials blamed a malfunctioning autopilot. Nevertheless, Bruce and Howard

RIGHT: Bruce Watt's first Liberator flight took place on 25 June 1941 as AM258's first officer. Built as an LB-30A, the initial production example of the breed, this Liberator I was later operated by BOAC.

CROWN COPYRIGHT



adjusted to life with elite civilian and military delivery pilots.

As the brothers mastered oceanic wind systems and navigational tricks in foreign latitudes, they became familiar with numerous multi-engine RAF types. On 4 July 1942, Bruce stepped into the Consolidated Liberator. Temporarily as co-pilot, Bruce joined FL914's five-man crew and participated in crucial airlifts after the Axis captured Tobruk in June 1942. Reacting to the British Eighth Army's supply shortage, US President Franklin D. Roosevelt promised aid and 11,000-mile flights from New York to Cairo via the South Atlantic route began. With 6,000lb (2,721.55kg) of cannon, mortar and rifle ammunition, FL914 staged to the Middle East. Thanks in part to 10 Liberators and crews, the North African campaign turned in favour of the Allies and Bruce returned to Montreal on 19 December 1942.



Howard also experienced the B-24. His first entered the records on 30 August 1942 at Miami with FL919. He, too, went on to watch for cobras and mambas in exotic locales and leave boot-prints in the truly breathtaking lands of several continents. At separate times, in different aircraft, they both marvelled at Cairo's pyramids through Saharan heat and trembled above steaming jungle chasms. The years in sub-Arctic snow squalls contributed to their calm demeanours when ice, fog or rain threatened the 'infinite exactitude' of precisely planned missions.

The work settled into routine deliveries and North America-wide positioning. After crewing Douglas DC-3s on milk runs to Labrador and Newfoundland, an unexpected announcement came from Howard.



With his aeronautical skills and inherent wisdom, Howard Watt could have moved into international airlines after delivering heavy aircraft during World War Two. Long hauls in Liberators discouraged him and he preferred short, exciting bush flying trips when his ferrying career ended. CANADA AVIATION AND SPACE MUSEUM

At the end of a voyage on 14 October 1942, he abruptly resigned, dismissing the drastic move with a snappy, "for personal reasons". In post-war years, he never discussed the decision with family members.

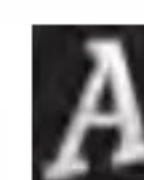
Bruce enjoyed the handling of three cumbersome Consolidated Catalina Ibs from a North Carolina receiving centre to Bermuda and then across 'the Pond'. There were many other interesting assignments before he completed his contract in April 1945. His accomplishments made him ideal airline material, but disappointment came when a medical indicated colour-blindness. Denied a peacetime aircrew licence, he acquired a tourist guest house near Montreal while Howard pursued civil aviation with St Lawrence Airways of Rimouski, 169 miles north-east of Quebec City. In spite of the name, the company bore no relation to his endeavours of 1935-40.

St Lawrence Airways operated Avro Anson Vs CF-FEO and CF-FEP. The organisation dissolved after CF-FEO stalled in the hands of another pilot and eight passengers

perished on 2 February 1949. For several summer seasons, Howard flogged Noorduyn Norseman floatplanes for Gold Belt Airways of Rouyn, Quebec, until he purchased a tourist facility and never flew again. He did enjoy a nostalgic jump-seat ride in a Quebecair Fairchild FH-227 on 6 December 1960.

"Our course was pretty much the same as when I flew the mail from Montreal to Rimouski and return in a new Fairchild 71 some 30 years ago", he wrote. "There was no radio or ground organisation then and that's when we really flew by the seat of our pants. It was grand to relive it again in the modern way."

Bruce succumbed to cancer on 14 January 1954 and Howard to a stroke on 24 December 1970. Like many bush pilots before them, they had lived with pre-war summer blackflies or winter's frozen fingers and, when needed, brought their skills and instincts to bear in helping bring global conflict to an end.



The author thanks historian Diana Trafford for access to family data on her uncles Bruce and Howard Watt.

BELOW LEFT: Howard Watt flew Buhl Air Sedan CF-ACX from Toronto for 500 miles north of the city to Kapuskasing on 5 February 1931 to gauge aviation opportunities. Although the Buhl aroused interest, he did not believe the public would pay for air travel since the Canadian Pacific Railway already served the pulp and paper community.

LIBRARY AND ARCHIVES CANADA

BELOW: On 18 September 1937, Bruce Watt experienced a cabin fire in DH83 Fox Moth CF-ATV, which often flew in company with sister-ship CF-ATX. Two injured passengers were taken to hospital in Rimouski on the St. Lawrence River, but Bruce escaped injury.

VIA DIANA TRAFFORD



PICTURE PERFECT



The contribution made by the RAF's photo-reconnaissance squadrons to the successful liberation of Europe was immense and appreciated. But while their activities around the D-Day period itself have often been given due prominence, what about the missions flown during the subsequent months of 1944, as the Allied advance continued? **WORDS:** ANDREW FLETCHER



It was increasingly no secret that the invasion of Europe was likely to take place in the late spring or summer of 1944. From March onwards the pressure on the Second Tactical Air Force's reconnaissance squadrons grew rapidly, with more calls for coverage of coastal defences, beaches, ports, roads, rail lines, marshalling yards, bridges, radar sites, airfields, 'V-weapon' launch sites, stores depots, troop concentrations, river lines and huge mosaics of Normandy and the Pas-de-Calais. Yet, despite being fully occupied with tasks over the continent, all with the exception of No 16 Squadron were hampered by re-equipment. No 140 Squadron was winding down its Spitfire operations, while for both No 4 Squadron and No 400 Squadron, Royal Canadian Air Force, the introduction of the Mosquito was proving problematic with serviceability issues and delays working crews up to the required standard. It now fell to No 16 Squadron and the Spitfire-equipped flights of 4 and 400 to fulfil the vast majority of 2TAF's photographic demands.

“Identifying radar sites was a major factor in D-Day's success”

Ongoing issues with the Mosquito led to the announcement at the start of May that both 4 and 400 would fully equip with Spitfires. Neither squadron was sad to see the Mosquitos go, as both had struggled to bring the type into service. The Spitfire offered higher serviceability and was much better-suited to the generally shorter-range, high-frequency sorties.

Activities by 2TAF's PR units during May continued to be

connected with the forthcoming invasion and, in line with other Allied air operations, many were flown to targets beyond the Normandy area. This was in order not to alert the Germans

that this region of France had been chosen for the invasion, being designed so no discernible pattern could be detected by the enemy.

With the landings scheduled for summer 1944, one of the most important tasks related to 'Overlord' was the destruction of the enemy radar network in order that the invasion fleet could avoid detection. Since the earliest days of the RAF's Photographic Reconnaissance Unit (PRU), locating the positions of enemy wireless and radar sites had

been a top priority. As such, much was known about the enemy's radar installations along the coast. It was calculated there was roughly one radar site for every four-and-a-half miles of coastline between Brittany and the Franco-Belgian border, all of which would have to be put out of action prior to D-Day.

On 22 May Typhoon and Spitfire fighter-bombers commenced concentrated attacks on the coastal radar sites. For the next two weeks the radar network was systematically pounded. Reconnaissance aircraft immediately followed up these attacks by taking low-level obliques, and from the 24th onwards high-level damage assessment sorties were conducted to photograph all the sites along the French coast from the Channel Islands to the Pas-de-Calais. Each one was revisited every time it was attacked and at three-day intervals in between, so repairs could be assessed to ensure no installation was capable of operating immediately prior to the invasion.

By D-Day not a single station was left fully functional, 93 of 98 being unable to transmit at all during the invasion period, allowing the fleet to approach undetected and achieve total surprise. The success of the PR organisation in identifying all the enemy's radar installations to allow for their suppression was a major contributor to the initial success of the landings.

Despite calls for cover of the coastal radar sites, all other tasks ➤

OPPOSITE PAGE:
A classic study of Spitfire PRXI EN654 being flown by test pilot Jeffrey Quill. This aircraft served with No 16 Squadron from June-September 1944.

KEY COLLECTION

LEFT:
A section of beach showing some of the German bunkers dotted along the northern coast of France. In preparation for the invasion, every yard of the coast was routinely photographed from high level to locate new defences and monitor existing fortifications. If more investigation was required, low-level 'dicing' sorties were authorised to obtain more detailed images.

VIA ANDREW FLETCHER

BELOW:
Sqn Ldr Tony Davis, CO of No 16 Squadron, poses on the tail of Spitfire PRXI PL848.

H. J. S. TAYLOR





TOP: Spitfire PRX MD193 of No 541 Squadron at Benson receives its invasion stripes just prior to D-Day. No 106 (PR) Group instructed all its squadrons to begin applying the markings from 4 June onwards and that from the 5th only aircraft so marked were to be flown. W. HOGG

ABOVE: Mosquito PRXVI MM281, which Wg Cdr Richard Bowen flew on No 140 Squadron's first operational sortie with the mark when he unsuccessfully attempted to photograph Le Mans on 29 January 1944.

P. BREARLEY

still required completing, and with the invasion looming pressure continued to build. As well as 2TAF's PRUs being fully committed to targets related to the landings, the units of No 106 (PR) Group — Nos 540, 541, 542 and 544 Squadrons — normally allocated to strategic PR operations were increasingly called upon. Of all the units involved in PR in the invasion area during May, by far the busiest was No 16 Squadron which flew a total of 246 Spitfire PRXI sorties.

June

All PRUs were informed at the start of June that their aircraft were to be painted with black-and-white recognition stripes by the 5th in preparation for the imminent invasion, the markings acting to differentiate Allied aircraft from enemy machines.

Once the landings began it was intended that every army would be directly supported by

its own reconnaissance wing. The tactical reconnaissance squadrons supporting each army would provide visual intelligence and some oblique photography of the front lines and beyond to the range of artillery and tactical mobility, whereas each wing's PR squadron — No 4 Squadron for

“The poor weather persisted, forcing more low-level sorties”

No 35 Wing and No 400 Squadron for No 39 Wing, RCAF — would be responsible for photography of the immediate operational depths up to a range of about 150 miles in front of each army. Beyond this the aircraft of No 34 (PR) Wing would secure intelligence for HQ 21st Army

Group to a depth of 300 miles, No 16 Squadron being the sole operator of PR Spitfires in the wing as No 140 Squadron was now fully equipped with the Mosquito PRXI and PRXVI.

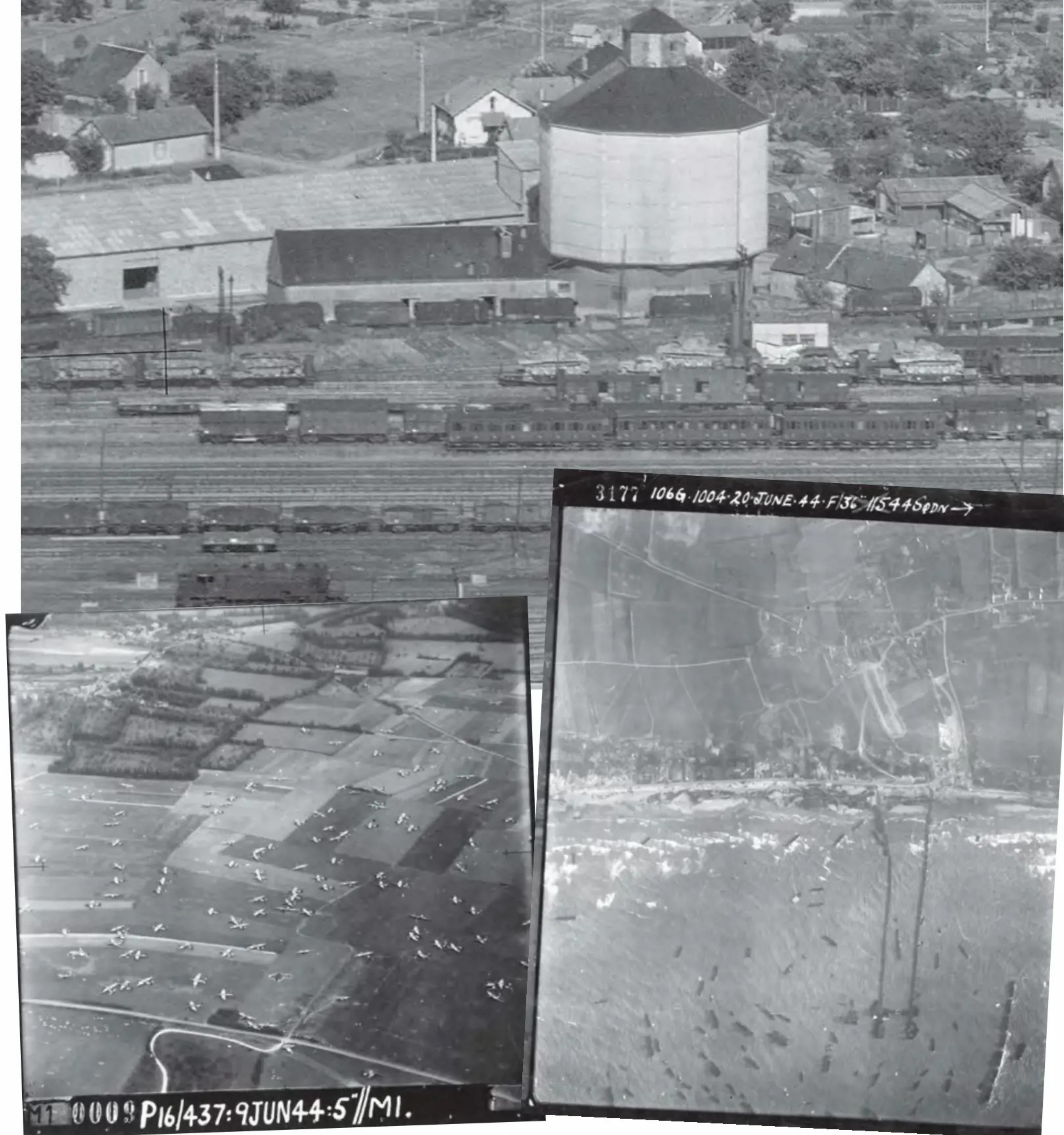
When D-Day dawned on the 6th the weather was initially fair, but as the day progressed it quickly deteriorated, all the high and a lot of the low-level sorties failing to secure any photographs. The poor weather persisted, forcing more low-level sorties to be flown in an attempt to get under the cloud. Many of these were thwarted by the conditions but pilots reported that when they were able to find breaks they were usually met by intense flak, especially near railway junctions.

Little opportunity presented itself for flying over the next few days, a great anti-climax — pilots had built themselves up for a period of intense activity and now they were practically grounded. By the 12th the conditions over Normandy finally improved enough for large-scale PR operations to resume, mostly to rail centres in northern France and pinpoints and mosaics near the front line, as well as to the bridges across the Seine between Le Havre and Paris which were being heavily interdicted to slow German reinforcements.

With Allied troops now firmly established on French soil, every effort was made to complete photographic tasks and for the remainder of the month operations were flown whenever the weather permitted. The only two sorties attempted by No 400 Squadron on the 25th both resulted in the pilots being forced to make emergency landings at hastily prepared advanced landing grounds (ALGs) in the beach-head due to weather and mechanical failure respectively, although one did secure vertical pinpoints of German gun positions.

July

Allied forces in France were involved in attritional fighting as they desperately sought to expand their perimeter against a stubborn German defence. The Cotentin Peninsula had been cleared and Cherbourg captured, although not before the Germans had destroyed the port facilities. On the eastern flank of the beach-head the British and Canadians were trying to clear Caen but progress was proving slow and bloody. The weather had again deteriorated with little opportunity



CLOCKWISE FROM LEFT:
On 5 June 1944, Sqn Ldr Charles Longley and Flt Lt Val Riley of No 140 Squadron were tasked with obtaining low-level cover of rail targets between Orléans and Le Mans in Mosquito PRXVI MM274. This oblique of the main railway station at Châteaudun shows numerous PzKpfw V Panther and SdKfz 251 half-tracks on a stationary train. The intelligence information contained in the image was of inestimable value, especially considering it was taken on the eve of the D-Day landings and that many of the sorties flown that day were unsuccessful due to cloud. P. BREARLEY

Piers at the western edge of the US Mulberry harbour at Vierville-sur-Mer off Omaha Beach, captured by No 544 Squadron's Fg Off Norman Burfield and Flt Sgt Alex Barron in Mosquito PRXVI MM272. Detailed to cover 'Crossbow' sites around Dieppe and targets in the Châtellerault area of central France, the crew were also ordered to cover the invasion beaches.

G. BURFIELD

Taken by 'Sandy' Webb, No 34 Wing's wing commander operations in a No 16 Squadron Spitfire PRXI, this low-level oblique looking east-south-east towards the village of Bréville-les-Monts from 1,000ft shows Airspeed Horsa gliders strewn across DZ 'N', one of the main drop/landing zones for the 6th Airborne Division east of the River Orne. D. GILBERT

for aerial reconnaissance over Normandy.

On 1 July, No 400 Squadron's 'A' Flight flew its nine Spitfire PRXIs to advanced landing ground B-8 at Sommervieu near Bayeux to respond more rapidly to army requests, making it the first RAF PRU to operate from French soil since 1940. The initial operations were flown from B-8 on the 3rd when six sorties were sent to targets around Caen, all of which were successful. The move enhanced operational flexibility and greatly expedited the unit's ability to fulfil photographic demands.

Flt Lt Alastair Gibb of No 16 Squadron was tasked on the 5th with low-level cover of rail junctions east of Caen, but the poor conditions prevented the pilot from locating his objectives. Low on fuel, Gibb landed inside the beach-head to top up his tanks but was stopped from taking off by the weather. Forced to spend the night in France, he returned to England the next day with stories of the conditions being endured by

the personnel at the ALGs, constant artillery and flak barrages making life "somewhat exciting."

No 400 Squadron suffered its first operational PRXI loss on the 17th, Flt Lt Frank Hanton being forced to abandon PA797 when his engine caught fire on a sortie to cover Villers-Bocage, Caen and Mézidon. He was able to bail out near Bayeux as he tried to return to B-8 but sustained burns to his face and injuries to his arms and legs.

At the very end of the month No 4 Squadron despatched a two-aircraft detachment to operate from inside the beach-head at B-10 Plumetot. The need for rapid photographic intelligence to meet urgent army requirements led to the deployment, it being planned to rotate pilots every few days.

June and July had seen No 140 Squadron, the sole operator of PR Mosquitos with 2TAF, not only involved in daylight operations but also flying at night, its aircraft equipped with flares for nocturnal

photography. This capability was proving very useful as Allied air superiority meant German troop movements were often limited to the hours of darkness, especially in immediate rear areas, and the ability to locate and track these activities greatly aided ground commanders. Despite a growing number of night sorties, most of the squadron's work took in coverage of primary railway lines and roads in northern France during daylight. These sorties were always a high priority and often had to be attempted at low altitude due to the poor weather. The Mosquito was not as well-suited to low-level operations as the Spitfire, but such was the urgency for cover that crews were forced into the de Havilland aeroplanes, the ever-present German flak taking a steady toll.

While flak was always a threat for PR aircraft, especially at lower heights, encounters with the Luftwaffe had been rare. Although there had been a number of instances during the first two

RIGHT:
Spitfire PRXIs of
No 400 Squadron,
RCAF at B-21 Sainte-
Honorine-de-Ducy.
400 began operating
some of its aircraft
from inside the
beach-head on 1 July
1944. D. GILBERT

BELOW RIGHT:
Typhoon FR1b EK427
was operated by
No 4 Squadron, but
is pictured having
reached early
post-war storage at
Kemble.

VIA ANDREW THOMAS

months of the invasion where German fighters had attempted interception, Allied air superiority had succeeded in keeping enemy air activity to a minimum, something which greatly aided PR operations.

Although the majority of photographic demands for the army were fulfilled by 2TAF's own PRUs, the sheer scale of tasks led to the units within No 106 (PR) Group often being called upon to help try and deal with any backlog. Some of these sorties were flown solely for the purpose of clearing army demands, but the majority involved secondary targets as aircraft transited the invasion area on their way to cover strategic objectives further to the south.

By the end of July the British and Canadians had driven the Germans out of Caen in a series of costly operations, forcing the enemy to commit the majority of his armoured reserves to that sector of the front in an effort to contain the Allied advance. Further west this progress enabled the Americans to begin Operation 'Cobra'. The weaker opposition facing the Americans started to crumble after a couple of days of heavy fighting and the German line disintegrated, allowing the Allies to make a rapid advance south. US troops were poised to break out into Brittany.

August

All of 2TAF's PRUs were heavily committed as August brought no let-up, with the fighting in Normandy reaching a critical stage. On 1 August No 4 Squadron carried out its first operation from inside the beach-head when Flt Lt Don Draper searched for a long-range railway gun which had been shelling Allied positions. He obtained photographs of the railway lines between Argentan and Caen from 12,000ft. Other than some inaccurate light flak the sortie was largely uneventful. However, when Draper's photographs were examined the interpreters found the railway gun which was subsequently attacked by Typhoons.

The intense fighting south of Caen meant No 400 Squadron was called up to meet numerous demands in the area. On 4 August the unit flew 16 sorties from B-8 with a further five from England. It received a signal from HQ XII Corps of the British Second Army the following day: "Please convey to all the pilots of 400



Squadron RCAF our appreciation for the excellent photographic cover they have flown for this Corps. The information gathered from these photographs has been invaluable for the planning of future operations, and for counter-battery purposes. The fighting troops have found that these photographs of the area in

**“The recce units
would now follow
closely behind the
fighting forces”**

which they have to operate are of the greatest assistance.”

The remainder of the unit moved from England during the evening of the 10th and reunited with the rest of the squadron at B-8. On the 15th there came another relocation to B-21 Sainte-Honorine-de-Ducy, about 15 miles south. Operations were not disrupted, the squadron's

Spitfire PRXIs having either flown directly to B-21 or taken off from B-8 on operations and landed at the new base on their return.

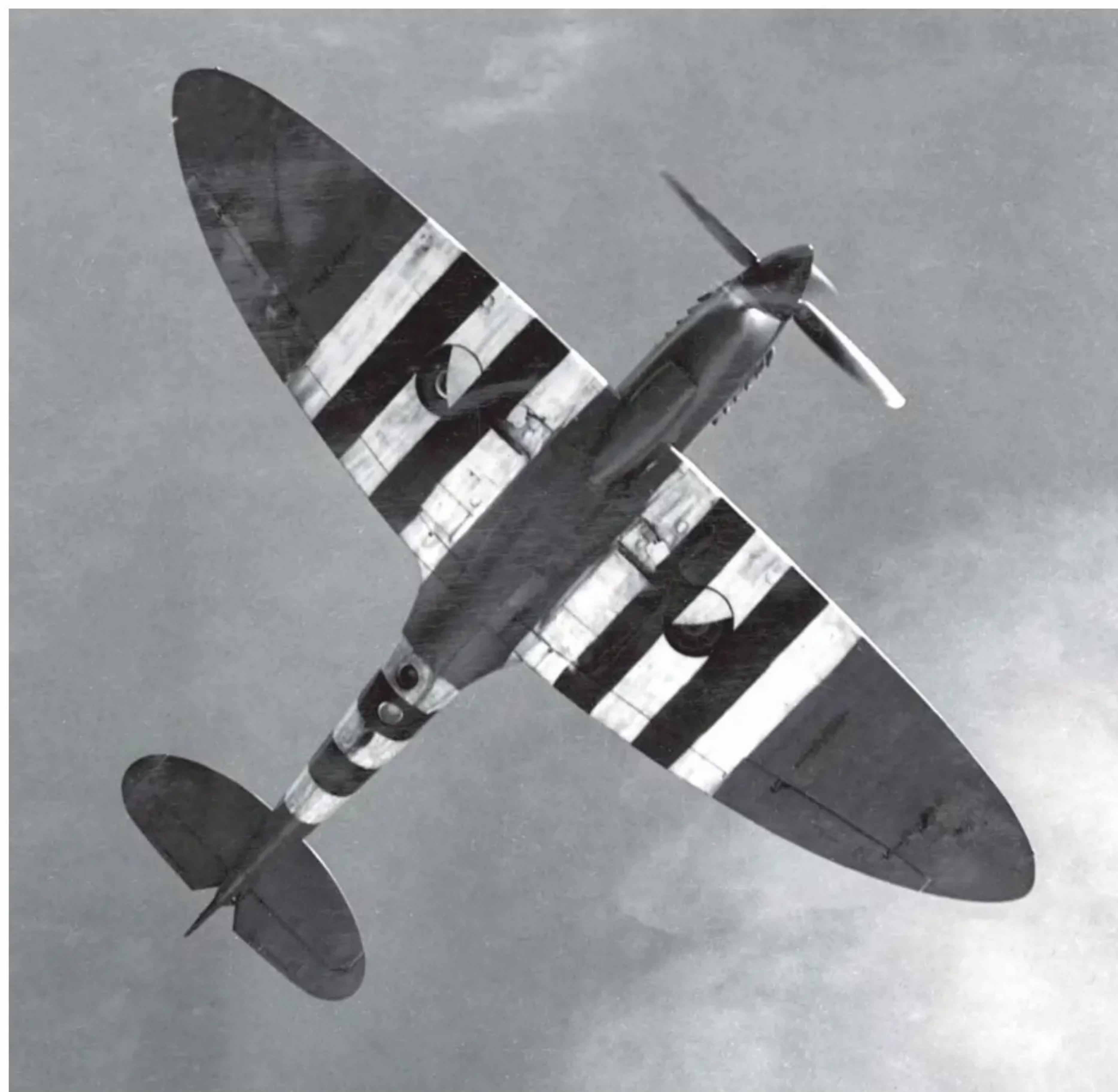
The following day No 4 Squadron transferred to B-4 Bény-sur-Mer, north of Caen. The pilots found the advance party and detachment from B-10 already set up and operations commenced on the 17th. Conditions at B-4 were fairly basic and heavy rains turned the area from “an arid desert into a sea of slippery, oozy mud”, but flying carried on. Proximity to the HQ issuing the photographic demands definitely expedited the despatch of aircraft and the subsequent processing and analysis of the intelligence gained. For the remainder of the campaign every effort would be made for the reconnaissance squadrons to follow closely behind the fighting forces. No 34 Wing was still operating from England but its subordinate units, Nos 16 and 140 Squadrons together with the recently re-formed No 69 Squadron with Wellington PRXIIIs for night operations, were put on notice to be ready to head to the Continent.

The Americans had now succeeded in breaking out of the western end of the beach-head, quickly over-running Brittany, and had swung round to the north. They were threatening to trap German forces in a large salient south of Caen, centred on Falaise. Determined counter-attacks by SS Panzer units attempted to hold open the mouth of the pocket, which enabled many thousands of German troops to escape, but by the 21st it was sealed and the bulk of the German Seventh Army was destroyed. From this point on, German resistance in northern France was effectively over and a full-scale retreat east began. This situation had been anticipated by planners at the 21st Army Group, Nos 16 and 140 Squadrons having already flown numerous sorties to all the major communications centres in north-eastern France and Belgium.

This pattern of operations continued during the second half of August as remnants of German units tried to cross the River Seine. So rapid was the German retreat that Nos 4 and 400 Squadrons often found the areas they were tasked to photograph had already been liberated. Allied forces in northern France had advanced across the Seine by the end of August and taken Paris, while in the south Operation 'Dragoon' had pushed the Germans north up the Rhône Valley and all German forces in France, other than those detailed to deny the Allies access to ports, were in a general eastwards retreat. It had been a busy month for all 2TAF's PRUs. To this could be added numerous sorties flown by No 106 (PR) Group in support of the invasion forces.

September

The Germans were still in full retreat, and in the first few days of September they abandoned much of north-eastern France and Belgium. By the 4th Antwerp had been captured by the British Second Army and the Pas-de-Calais isolated by the Canadian First Army, but as of the 14th the front lines had stabilised as the Germans consolidated their positions along the German frontier and in the southern Netherlands along the Scheldt and the Maas. The enemy had left strong garrisons in most of the Channel ports to deny their immediate use to the Allies, and controlled both banks



of the Scheldt Estuary which made Antwerp useless as a port.

With the rapid Allied advance into Belgium and towards Germany, a limited airborne operation was planned to seize the Rhine bridges in order to allow the establishment of a bridgehead for further advances, but weather and logistical problems delayed its start. Even though the ground forces involved in the attack would come from the British Second Army, which was provided with PR by 2TAF, it was No 106 Group which was called upon for the bulk of the photography, No 541 Squadron flying nine Spitfire sorties on the 6th to cover the bridges across the Maas, Waal and Rhine between Grave and Arnhem. Three of these were carried out at low level by PRXIXs fitted with a new forward-facing oblique camera installation.

Two days earlier the bulk of No 34 Wing's aircraft had transferred to A-12 Balleroy, an airstrip in the American sector south-west of Bayeux. Operations from the new base began on the 5th, with No 16 Squadron flying seven Spitfire PRXI sorties to the Netherlands, eastern

France and the lower Rhine districts of Germany, and No 140 Squadron two Mosquito missions along the River Maas. Due to the German retreat the wing was located far to the rear and had only the most tenuous of communications links with 2TAF and 21st Army Group headquarters. Consequently a move to B-48 Amiens/Glisy was initiated, the first aircraft proceeding there on the 9th.

The Germans had stopped their full-scale retreat by the second week of September and stabilised their lines. Strengthening enemy resistance forced the Allies to upgrade their earlier plans for a limited airborne operation to now include the whole of the First Allied Airborne Army. Operation 'Market Garden' still involved the capture of bridges over the Rhine to bypass the Westwall defences, but instead of a single airborne division the plan called for the near-simultaneous drop of three divisions. They would be relieved by an armoured spearhead which, once across the Rhine, would break out onto the North German Plain. No 541

ABOVE:
A No 541 Squadron Spitfire PRXI, PL775, displays its invasion stripes and under-fuselage camera ports. KEY COLLECTION



TOP AND INSET:
The Rijnbrug at Arnhem, the road bridge across the Rhine, as seen in low-level obliques taken by Spitfire PRXIX RM644 flown by Flt Lt Lionel Scargill of No 541 Squadron and No 34 Wing's Wg Cdr Sandy Webb in Spitfire PRXI PL834 of No 16 Squadron, the latter featuring destroyed German vehicles littering the road. VIA ANDREW FLETCHER

Squadron continued to furnish the bulk of the PR for the operation, although No 39 Wing did carry out work for XXX Corps which would lead the ground assault.

No 34 Wing's Wg Cdr 'Sandy' Webb, together with three pilots from No 16 Squadron, flew back to Northolt on 16 September for a detachment in support of 'Market Garden' which was due to begin the next day. Their Spitfires would be available to fulfil photographic tasks originating directly from HQ First Allied Airborne Army once the airborne landings began.

The first sortie was undertaken on the 17th when Webb, flying at low level, covered bridges and drop zones at Arnhem, Nijmegen and Eindhoven in PRXI PL834. On landing he reported straight to Lt Gen Lewis Brereton, the commander

of the First Allied Airborne Army, to report what he had seen. After six days of heavy fighting the Germans managed to clear British paratroops from the centre of Arnhem. Although combat continued, 'Market Garden' had effectively failed, but it was the 25th before the remnants of the British 1st Airborne Division were withdrawn south across the Rhine. The operation had punched a large salient north into the German lines but not succeeded in its primary objective of establishing a bridgehead over the river.

'Market Garden' had expended most of the supplies available to the Allied ground forces, which were still dependent on over-extended logistical routes stretching back to the landing beaches. Failure to clear the Channel ports or the Scheldt Estuary meant an enforced end to offensive operations along most of the front while the Allies paused to rebuild their strength. This enabled many 2TAF units to get nearer to the front, such as No 34 Wing. It went 120 miles north-east to B-58 Melsbroek, the transfer being completed by the 27th. Operations continued at a low tempo as the weather restricted flying, but as the wing's operational area began to extend to the German border and beyond, encounters with enemy fighters were more frequent.

As No 34 Wing was preparing to head to the Continent, on 1 September No 400 Squadron was again on the move, this time to B-34 Avrilly with the first sorties from the new base being flown that afternoon. An improvement in the weather allowed 27 missions to be carried out on the 11th with targets along the Maas and Rhine featuring strongly on the list of objectives. Two pilots reported seeing steep climbing contrails in the Hague and Rotterdam areas, these probably being V2 trails. Sightings of V2 launches started to become more common and pilots were encouraged to try and photograph the launch areas.

Six days later the squadron had its first encounter with a German jet. Fg Off Dan Wilson was tasked with pinpoints in the Zwolle area but as he flew home he observed an unidentified twin-engined aircraft approaching at high speed. It flew a wide, arcing approach and as it neared the pilot made a steep climbing turn into it. The machine flashed past and was not seen again. On the 20th the squadron relocated to B-66 Blankenberg, but the ongoing poor weather greatly limited its activity.

Like No 400 Squadron, the start of September saw No 4 Squadron going forward to maintain contact with its controlling headquarters when the whole of No 35 Wing arrived at B-27 Boisney on the 2nd. This was the first of four moves made by the squadron during the month, ultimately ending up at B-61 Saint-Denis-Westrem near Ghent. Most of its work was over the Scheldt and the western Netherlands although periodic sorties were flown to Boulogne, Calais and Dunkirk which remained in enemy hands. This was soon supplemented by active searches for V2 launch sites.

October

The failure of 'Market Garden' meant there would be no quick end to the war and Allied forces set about consolidating their positions for the winter. They would not be able to resume full-scale offensive operations until their logistics issues were resolved, and as such they set about clearing the Germans from both banks of the Scheldt Estuary which controlled the shipping approaches to Antwerp, the only port capable of fulfilling Allied supply needs.

Heavy fighting along the Scheldt involving the Canadian First Army and further east by the British Second Army to drive the Germans back across the Maas continued from the start of October until mid-November. Through some hard-fought engagements the German defenders were finally defeated, and Antwerp opened to shipping on 28 November. Reconnaissance operations by 2TAF's PRUs settled down into a generally routine pattern as the sectors in front of each army remained more or less constant. Monitoring German positions along the Scheldt remained one of the primary tasks of No 4 Squadron together with regular coverage of the western and central Netherlands. October saw the squadron receive a number of Typhoon FRIBs for low-level work when the cloud conditions prevented high-level photography, but most sorties continued to be flown in Spitfires.

On 28 October No 400 Squadron lost its first pilot on operations since converting to PR Spitfires. Now based at B-78 Eindhoven, Flt Lt William Kennedy took off in PRXI PL925 on his second sortie of the day, this time tasked with targets between the Dutch border and Hamm in Germany. It seems likely he was hit by flak near Arnhem, his aircraft crashing with the pilot still at the controls. Compared to the other PRUs in 2TAF, No 400 Squadron had led a charmed life. Not only was Kennedy the first pilot lost but the unit had incurred very few aircraft losses on operations or in accidents.

November

Throughout what became known as the Battle of the Scheldt, No 4 Squadron flew in support of the troops fighting on the ground, but once the Scheldt Estuary had been cleared of Germans it could concentrate on tasks further to the



ABOVE: Gp Capt Pat Ogilvie, commander of No 34 (PR) Wing, on a No 16 Squadron Spitfire PRXI. On 11 December 1944 he took off in one of No 16 Squadron's old FRIBs, ML206, to carry out a weather reconnaissance over the North Sea. A weak signal was received asking for a steer but nothing further was heard from him. Ogilvie was one of the most experienced PR pilots in the whole RAF, having commanded No 3 PRU from its formation back in 1940. H. J. S. TAYLOR

north behind the Maas and the Lek and into Germany, and for the remainder of the year this section of the front line remained relatively quiet. The squadron made its last move of 1944 on 23 November when it transferred to B-77 Gilze-Rijen, the base having been recently vacated by the Luftwaffe. As the Canadian First Army was trying to dislodge the Germans from the Scheldt the British Second Army was called upon to secure the First Army's right flank and clear the Germans from the North Brabant region of the Netherlands with No 39 Wing continuing to give support.

Although by the start of November North Brabant had been rid of the enemy, heavy fighting was still taking place to the east as the British Second Army attempted to

eliminate the German bridgehead on the Maas west of Venlo. For the remainder of the month much of No 400 Squadron's attention was now directed to this sector of the front and the area beyond into Germany.

While Nos 4 and 400 Squadrons concentrated on fulfilling demands for their respective armies, No 16 Squadron continued to range deeper into enemy territory to obtain photographic intelligence for HQ 21st Army Group. Now it was flying more of its operations into Germany, more pilots reported sightings of German jets, particularly the Me 262, but for the most part they could be avoided as long as the enemy was seen first.

Poor weather still curtailed operational flying as October gave way to November, and when sorties were attempted they were often unsuccessful due to cloud. As with No 16 Squadron the other squadrons of No 34 Wing, 140 and 69, began to conduct more missions deeper into Germany, but the weather over the remaining months of 1944 greatly hampered things, many daylight sorties attempted by No 140 Squadron being disrupted by cloud. Night operations were not affected to such an extent though thick ground haze often spoilt the photographs obtained. Since the stabilisation of the front lines in



LEFT: B-77 Gilze-Rijen is believed to be the location of No 4 Squadron Spitfire PRXI PL840. The image was taken during the winter of 1944-45 by the oblique camera of another PR Spitfire undertaking a camera test just prior to take-off.

C. MEDDOWS SMITH



ABOVE:
The much-
photographed
Spitfire PRXI
PL775 spent its
entire operational
career with No 541
Squadron, beginning
in May 1944.
KEY COLLECTION

September the level of demand for night reconnaissance had steadily mounted, with cover of enemy troop movements always a high priority.

December

The front line in the Netherlands was now more or less static, the main area of fighting being around the German bridgehead across the Maas where the British Second Army was trying to advance towards Venlo. Other than on the 3rd, which allowed Nos 16 and 400 Squadrons to fly 12 and 15 sorties respectively, the weather for the first three weeks of December prevented much operational flying by any of 2TAF's PRUs. Within No 34 Wing the advent of the Me 262 had made No 140 Squadron's Mosquitos too vulnerable for daylight operations, so the decision was made to limit them to a nocturnal role. HQ 21st Army Group's daytime PR requirements would be met solely by the Spitfires of No 16 Squadron.

No 106 Group was informed at the start of the month it would be required to mount a detachment to the Continent in support of the First Allied Airborne Army to assist in gathering intelligence to prepare for further airborne landings. Ultimately three Spitfires from No 541 Squadron — a PRX, PRXI and a PRXIX — were authorised to deploy to Brussels-Melsbroek, from where

No 34 Wing had been operating for a number of months. Arriving on the 15th, the detachment was met with a period of very unfavourable weather and was unable to fly.

Less than a day after their arrival the Germans launched their Ardennes offensive with the aim of retaking Antwerp. The inclement conditions had allowed enemy forces to move up to the front undetected by aerial reconnaissance and the attack came as a complete surprise to the Allies. It made good initial progress, but by the 23rd had largely been contained as Allied reinforcements rushed to the area.

The PRUs of 2TAF, which had been practically grounded for a week, were able to fly multiple sorties on the 23rd, No 4 Squadron carrying out 18 successful operations. This tempo was maintained on Christmas Eve with No 16 Squadron attempting 13 sorties, all of which secured photographs. The German advance in the Ardennes had been brought to a halt come the year's end, and although the enemy held a large salient the Allies were slowly applying pressure to push it back.



As 1944 drew to a close the PR squadrons of 2TAF, ably supplemented by No 106 (PR) Group, could be proud of their achievements. They had flown many sorties in support of the Allied forces which had been fighting in Europe

since D-Day and, despite often difficult conditions, all units were always on stand-by to obtain aerial intelligence. The photographs taken had been highly beneficial to the prosecution of the war along the 21st Army Group's front.

The AOC-in-C of the Allied Expeditionary Air Force, ACM Sir Trafford Leigh-Mallory, heaped praise on the PR organisation and the contribution made by all the PRUs to 'Overlord' and subsequent campaign: "Prior to the invasion photographic reconnaissance was always very accurate and was throughout of vital importance to all of the fighting forces."

For three years a constant watch had been maintained on every communication link and military installation of any significance in north-west Europe, in preparation for when Allied forces would return to the Continent. Once troops were ashore, PR provided direct support to the formations fighting on the ground to give them as close to real-time aerial intelligence as was possible with the technology of the day. This reliable flow of up-to-date information allowed Allied commanders to counter enemy threats and ultimately defeat the German army. The role played by PR in this cannot be underestimated, and the results achieved were out of all proportion to the relatively limited resources employed for the task.



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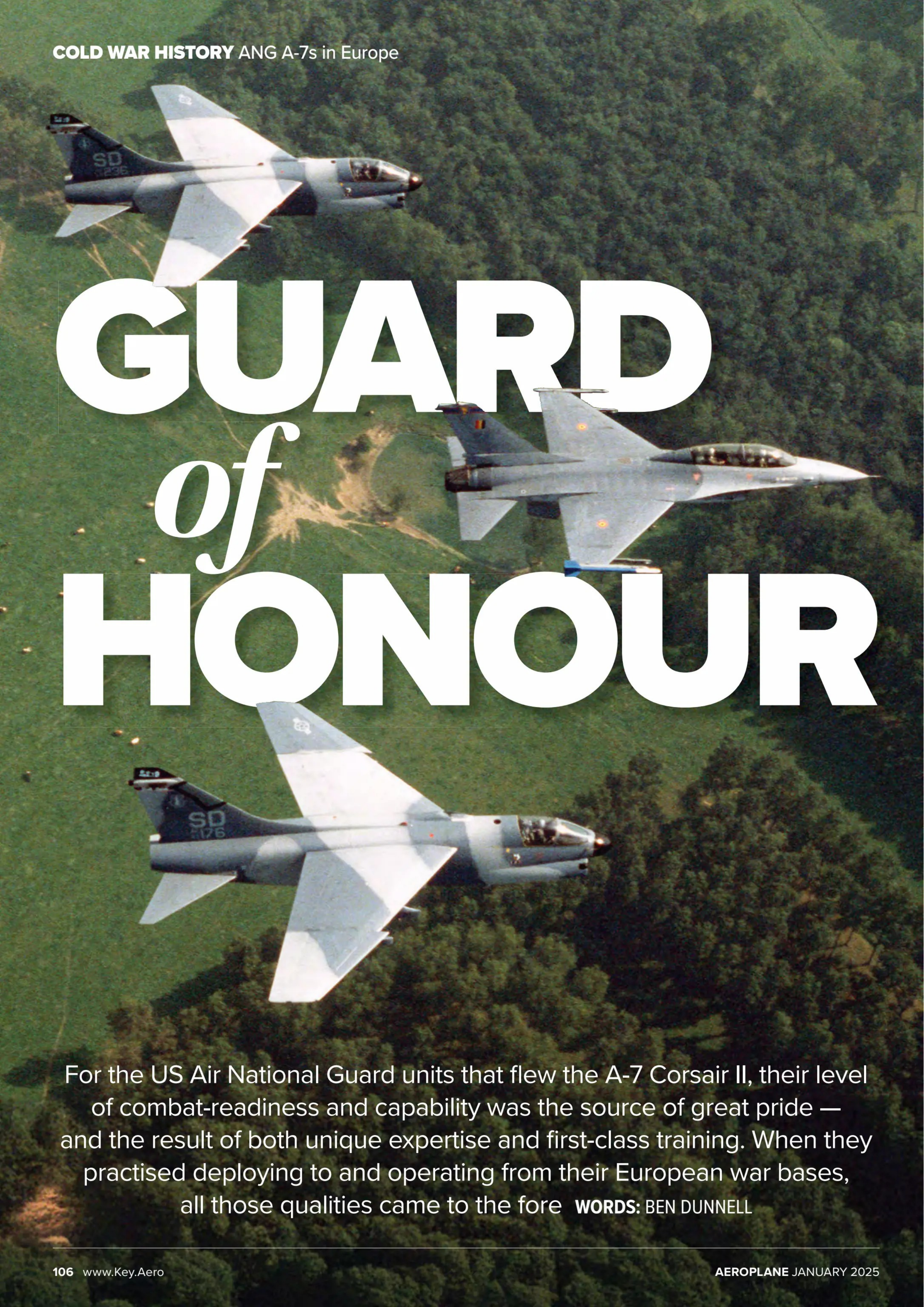
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Three A-7 Corsair II fighter jets are shown in flight over a dense, green forested landscape. The jets are arranged in a staggered formation, with one in the upper left, one in the middle right, and one in the lower left. The jet in the upper left has 'SD 1236' on its tail. The jet in the lower left has 'SD 1176' on its tail. The jet in the middle right has a Spanish flag on its tail. The title 'GUARD of HONOUR' is overlaid in large white text, with 'of' in a script font.

GUARD *of* HONOUR

For the US Air National Guard units that flew the A-7 Corsair II, their level of combat-readiness and capability was the source of great pride — and the result of both unique expertise and first-class training. When they practised deploying to and operating from their European war bases, all those qualities came to the fore **WORDS: BEN DUNNELL**

“**T**rain as you will fight and, if possible, with those you will fight alongside”. It was worth Maj Mike Rice of the New Mexico Air National Guard stressing that aphorism. The role of the ANG during the Cold War in bolstering regular, active-duty American forces in Europe made such in-theatre training vital. Those they would fight with were stationed thousands of miles away. And while excellent opportunities were often available near their home bases around the continental United States, there was no substitute for something more like the real thing.

Rice was assigned as operations officer of Detachment 7, Air National Guard Support Center, set up temporarily to plan and execute the 1988 exercise ‘Creek Corsair’. Specifically tailored, as the name suggests, to the ANG’s A-7 Corsair II unit community, it had seen three squadrons each spending two weeks in West Germany, getting to know the operating environment, familiarising themselves with procedures and integrating with other locally based assets. It complemented the regular round of ‘Checkered Flag’ deployments to their designated European war bases. All this made the Guard’s Corsairs familiar visitors to the continent’s skies. And it further boosted the effectiveness of an already very seasoned, capable community.

‘Total Force’ was the US Air Force buzz-phrase of the early 1970s. Drafting men to fight in Vietnam had proved highly controversial — far superior, it was felt, increasingly to use better-equipped and better-trained National Guard and Reserve elements. More economical, too. The Air National Guard would now be equipped, trained and evaluated as a full partner in the Total Air Force team.

The story of how it came to operate the A-7, and the attributes it brought, was inextricably bound up with this concept. The active-duty air force had been pressed into operating Vought’s outstanding jet as a close air support platform, much to the chagrin of some since it had been developed for the US Navy. Despite the A-7’s fine Vietnam combat record, a bespoke platform would have been preferred. As soon as the A-10 Thunderbolt II became available, the Corsair was on its way out. But the regulars’ loss was the



Air Guard’s gain, and for close on two decades the ‘SLUF’ (‘Short Little Ugly F*****’) was a mainstay of its inventory.

The era began on 19 October 1973 when the 188th Tactical Fighter Squadron of the New Mexico ANG’s 150th Tactical Fighter Wing received its first A-7Ds, fresh from the LTV Aerospace factory in Dallas. Those that followed — equipping 16 squadrons across 12 states — were a mixture of new-build and

“The Corsair handled real well, and it flew real well”

ex-active component. In many ways, the Corsair was an ideal attack aircraft for the Air Guard. It boasted a state-of-the-art navigation and weapons delivery computer system coupled with a head-up display that made it a formidable air-to-ground platform. A sizeable cadre of personnel already experienced on type was able to ease the transition of Guardsmen coming to it afresh, valuable indeed given the initial lack of a two-seat trainer variant.

A practising attorney when he joined the Oklahoma ANG as an F-100 Super Sabre pilot, Lt Gen Harry M. ‘Bud’ Wyatt III — who retired in 2013 as director of the entire Air National Guard — later transitioned to the A-7. He recalled to the author, “Most of our training back in those days for weapons delivery was low-altitude ingress and egress with a pop-up delivery to the target... the A-7 allowed us to get down a little bit lower [than the F-100] and had a much better weapons delivery system. It handled real well, it flew real well, and it had a reasonably good top-end speed down low — we could get to between 450 and 500kt at low level.”

A good mount for the demands of the European theatre, then. Had the situation necessitated it, the Air Guard A-7s would have been gained by USAF Tactical Air Command for wartime operations, and deployed to bases in Europe. Preparatory deployments were conducted under TAC’s ‘Checkered Flag’ programme, rehearsing all aspects necessary to execute the mission over an average of two weeks. “If the Soviet Bloc forces came through the Fulda Gap and invaded western Europe”, said Maj Gen Mason Whitney, adjutant general of Colorado until 2007, “we would have gone to our ‘Checkered Flag’ base and fought the war from there.”

ABOVE: Normally based at Rickenbacker ANGB with the Ohio ANG’s 166th TFS/121st TFW, A-7D 71-0369 is pre-flighted at RAF Sculthorpe, Norfolk during ‘Coronet Castle’ in April 1983.

USAF

OPPOSITE PAGE: September 1988’s ‘Coronet Stone’ deployment took 12 Corsair IIs from the 114th TFG at Sioux Falls, South Dakota, to Brustem AB in Belgium for involvement in the ‘Reforger’ exercise. Here, two A-7Ds are led by a Belgian Air Force F-16B. USAF

RIGHT:
A-7Ds of Michigan's 107th TFS/127th TFW from Selfridge ANGB being pre-flighted at Gioia del Colle, Italy, during the 'Coronet Packer' deployment in May 1984. USAF



BELOW:
Fully 18 A-7Ds and A-7Ks belonging to Pennsylvania's 146th TFS and the 188th TFS from New Mexico detached to RAF Wittering in July 1983. This deployment was named 'Coronet Mail'. USAF

Whitney had regular USAF experience on the A-7. When he left the air force, he joined the Colorado ANG at Buckley ANGB and rose to become commander of the 140th TFW. A very seasoned instructor pilot, before two-seat A-7K trainers became available from 1981 he specialised in flying chase during pilot conversion sorties, earning him the nickname 'Chasin' Mason'. He pointed out, "You had all kinds of manpower available to you in the active-duty force that you didn't have in the Guard, but in the Guard you still had to maintain the same levels of readiness". While not all the squadron pilots were available on a daily basis as their day jobs intervened, skills were constantly honed. "We focused a lot, of course,

on the different elements of our DOC — designed operational capabilities — mission that we were required to maintain: close air

“The objective was to stay below the Soviets’ radar coverage”

support, interdiction, suppression of enemy air defences, air-to-air.”

That went for the European visits just as it did back home. Run by TAC, 'Checkered Flag' deployments

lasted an average of two weeks, with ballpark figures of 12 aircraft, 25 pilots and 250-270 other personnel, plus support equipment. These were 'maximum efforts', it being command policy to involve as many people as possible in practising all the elements involved in mobilisation for a crisis. Once there, the ANG units were integrated into theatre command and control systems, working with the NATO operations centres which would task them come wartime. Often the A-7s' presence would coincide with major NATO or nationally run exercises.

West Germany's military flight test base at Manching, Bavaria, hosted the inaugural Air Guard Corsair deployment to Europe. Taking place from 13-27 May 1977,





LEFT: Sculthorpe was a USAF stand-by base, reactivated to host 'Checkered Flag' Corsair exercises. In war it was to host up to 54 aircraft. These two Ohio ANG A-7Ds engaged in the 'Coronet Castle' deployment, 73-1000 from the 166th TFS at Rickenbacker and 70-1007 of the 162nd TFS at Springfield, are in the maintenance hangar. USAF

it was codenamed 'Coronet Whist'. Involved were eight A-7Ds from the Pennsylvania ANG's 146th TFS/112nd TFG in Pittsburgh and 10 operated by the 166th TFS/121st TFG, Ohio ANG at Rickenbacker AFB. That November, Gilze-Rijen in the Netherlands was the location of 'Coronet Ante', this during NATO's 'Cold Fire' exercise. The participants this time were nine aircraft each from Colorado's 120th TFS/140th TFW at Buckley ANGB and New Mexico's 188th TFS/150th TFG at Kirtland AFB.

In the UK, RAF Wittering was first to receive one of these detachments. 1978's 'Coronet Teal' featured a dozen jets belonging to the 157th TFS/169th TFG, South Carolina ANG, accompanied by trios from Ohio's 166th TFS and Pennsylvania's 146th TFS. The base near Peterborough became the most regular British haunt for the Guard Corsairs, receiving five further deployments between then and 1988. It was selected as a co-located operating base because, had conflict erupted, most of the resident Harriers would themselves have moved out on forward deployment.

'Bud' Wyatt was there on several occasions with the 125th TFS, Oklahoma ANG. "We would take off, navigate low-level into [mainland] Europe, practise some weapons deliveries, and usually recover to a European base", he recalled. "There some of the weapons loaders from the different countries would be able to practise on our aircraft before we turned around and went low-level back to Wittering. They didn't get to

see the A-7 very often, so we tried to get around as much as we could. On occasion we spent three or four days in [mainland] Europe, hopping around from base to base."



From each location, the A-7 pilots had a selection of pre-assigned targets to hit behind the Iron Curtain. "We had", said Wyatt, "some navigation points leading up to them that we could practise on low-level navigations to get used to the countryside and the routes. If we had needed to do it for real, we would at least have seen the ingress and egress routes, and some of the points leading up to the attack."

"Back in those days, the objective was to stay below the Soviets' radar coverage. When you combine the fact that we trained for that with the very accurate weapons delivery system on the airplane and some really experienced, senior pilots in the Air National Guard, coupled with the air superiority we believe we would have enjoyed, I think we would have done very well. We were more concerned with triple-A and surface-to-air missile coverage — we let the fighter guys take care of the air threat."

That said, one of the 125th's Wittering stays, 'Coronet Canvas' in 1981, was to have featured an air-to-air element. After some escorted ➤

BELOW: 'Coronet Eclipse' in May 1987 saw a dozen Corsairs from the 107th TFS, Michigan ANG — including A-7D 72-0214 — deploying to Gioia del Colle in Italy. From there they took part in NATO's Exercise 'Dragon Hammer' alongside other American, Italian and Turkish forces. USAF



COLD WAR HISTORY ANG A-7s in Europe



ABOVE: An A-7D flown by Michigan's 107th TFS, detached to Gioia del Colle, holds the slot position in a mixed formation staged during Exercise 'Dragon Hammer '87'. Also involved are an Italian Air Force Tornado and F-104S, and a Turkish Air Force TF-104G. USAF

air-to-air missions, the deployment ended with a bombing contest between the based Harriers — to quote No 1 Squadron's operations record book, "armed with Mk1 eyeball, assisted sometimes by Mr Ferranti" — and the A-7s, with their "impressive weapons systems... The debrief and lively discussion of the competition's rules resulted in the contest being declared an honourable draw — the second Boston tea party was thereby averted". Both parties had hoped to indulge in a bout of 2-v-2 combat, but US Air Forces in Europe headquarters at Ramstein put paid

to it, saying such a thing was outside their rules.

Certain British bases saw especially large numbers of 'Checkered Flag' visitors. Twice the Ohio ANG put 24 jets into RAF Sculthorpe, in 1983 for 'Coronet Castle', which took in the RAF's 'Mallet Blow' exercise, and again for 1986's 'Coronet Miami'. Of those, 'Coronet Castle' was notable for being the first occasion for more than a decade on which a squadron-sized unit had crossed the Atlantic without tanker support. No fewer than 36 A-7s were sent by Iowa and South Dakota to RAF Waddington

for 'Coronet Buffalo' during 1985. Such figures, such events, are unthinkable today unless deploying for combat operations. And just consider the range of types the squadrons on 'Coronet Buffalo' — South Dakota's 175th TFS, and the 124th and 174th from Iowa — were able to fly against. Dutch F-16s, German F-4Fs, USAF F-15s and 'aggressor' F-5Es all mixed it with the 'SLUFs'.

'Checkered Flag' was a Europe-wide commitment. In the far north, Rygge, Ørland and Evenes all acted as hosts in Norway. To the south, the 120th TFS, Colorado ANG covered

RIGHT: Committed to Exercise 'Central Enterprise', for which it sent 12 aircraft to Brustem in Belgium, the Iowa ANG's 174th TFS flew two A-7Ds over in advance to appear at RAF Mildenhall's Air Fete '90; this is 70-1008, tucking its wheels up on departure.

JOHN DUNNELL





LEFT:
The 1990 edition of 'Creek Corsair' brought seven Corsairs to Spangdahlem. This is A-7D 70-0955 of the Virginia ANG's 149th TFS/192nd TFG, home-based at Byrd Field. ALAMY

off Greece and Turkey. Its maiden foray was on 1979's 'Coronet Rider' to Merzifon, at that stage the longest 'Checkered Flag' A-7 deployment yet with 24 aircraft spending 30 days at the Turkish base. It was, said the official unit history, "the first time any Air National Guard unit had deployed under 'bare base' conditions in which only a runway and water supply were provided."

Almost by definition, the chance to train in the right environment for wartime operations was valuable. But could it have been better? Some pilots felt they should have been given more European theatre integration in place of those sorties they could have performed from their Stateside home bases. Others were of the view that co-ordination with NATO's tasking agencies might have been better. Was there, perhaps, another way?

The ANG thought so. In parallel with TAC's 'Checkered Flag', during the latter half of the 1980s the Air Guard added its own complementary deployment programme, the smaller 'Creek Corsair'. With a specific focus on operations and maintenance, the aim was to provide extra training in the European environment and procedures, in part through integration with local assets. At the same time, it helped acquaint NATO planners and tasking agencies with the A-7, otherwise only operated within the alliance by Greece and Portugal, and thus not such a



common asset in northern Europe. Every effort was taken to keep costs down, so the aircraft stayed for the six-week duration while personnel rotated every fortnight, using KC-135 tankers on navigation training missions.

Four A-7s from Iowa, Oklahoma and South Dakota detached to the Luftwaffe F-4 station at Wittmund

“The debrief saw the contest with the Harriers declared a draw”

under the 'Creek Corsair' name in 1986, but the format solidified when the biennial event used a USAF base in Germany. Spangdahlem AB was the choice, missions being flown with the resident F-4Gs and F-16Cs of the 52nd TFW. Iowa, New Mexico and Ohio were involved in 1988, bringing a total of six A-7Ds and a two-seat A-7K; two years later it was the turn of Colorado,

Pennsylvania and Virginia. A "rainbow deployment", a member of the Colorado contingent called it.

The flying built up in gradual stages, from a supervised initial trip for local-area familiarisation into a seven-sortie programme devised with the aid of the ANG Fighter Weapons School at Tucson, Arizona, an instructor from which was on hand throughout proceedings acting as the exercise weapons officer. There was low-level work, interdiction on USAFE electronic warfare ranges with support from Spangdahlem's own 'Wild Weasel' F-4Gs, practice for minimum-risk departures and recoveries, air combat training with F-16s, F-15s and F-4s as the adversaries, and hunter/killer missions integrated with the 52nd TFW.

Developing the level of difficulty, the Wednesday and Thursday of the second week saw other NATO assets entering the fray for combined operations, the A-7s sitting on alert in hardened shelters awaiting tasking orders via telephone or radio. For the pilots of New Mexico's 188th TFS, an added level of difficulty came from doing the whole of this element under simulated chemical warfare conditions, with the relevant clothing and equipment. Another of the detachment staff, Maj Hugh Sloan, commented that the 'building-block' approach turned "every flying hour into a geographic and coordinated mission" ➤

RIGHT:
In immaculate formation, six 138th TFG A-7Ds cross the Atlantic in June 1991 to take part in Exercise 'Central Enterprise'. Their destination was RAF Waddington, which had been earmarked to host two 18-aircraft Corsair squadrons in wartime. VIA 'BUD' WYATT



experience we can't achieve in less realistic settings."

'Creek Corsair' was a great success. Those involved said as much to a study of Air Guard fighter deployments to Europe, while also suggesting ways in which future editions might be improved. "USAFE units and NATO allies," the report said, "were able to see firsthand how the survivability, accuracy, and range of the A-7 make it a valuable asset in the current tactical doctrine of attacking follow-on forces deep in enemy territory."

Those capabilities had been enhanced on 83 A-7Ds and A-7Ks — equipping Iowa's 124th TFS, Oklahoma's 125th and New Mexico's 188th — through the addition of the LANA (Low-Altitude Night Attack) system. Incorporating a pod-mounted Texas Instruments AN/AAR-49 FLIR (forward-looking infra-red) linked to a new Singer Kearfott navigation and weapon delivery computer and GEC wide-angle head-up display, it afforded automatic terrain-following in all weathers. But, with the end of the Cold War, the type's time was already up when the last 'Creek Corsair' participants left Spangdahlem in July 1990.

Times were changing, and not in the A-7's favour. The August 1990 invasion of Kuwait by Iraqi forces prompted a massive build-up of American forces in the Gulf, but the Air Guard's Corsairs played no part. Mason Whitney remembered it well. "As soon as we knew that there was going to be US military involvement,

I called up the National Guard Bureau and said, 'You realise that the 120th TFS has been operating in that territory, out in Turkey?' We knew that Incirlik AB was going to be one of the main bases for operations conducted in Iraq, we had all kinds of great experience in that area over 20 years, we had great friendships with Turkish officers — we'd have been ideal to go over. But the air force said it didn't need the Guard at all."

There were still two European deployments to go in 1991. Spangdahlem took in five jets each

“ We tried to be innovative in designing new tactics ”

from Iowa's 124th TFS and New Mexico's 188th for 'Sentry Corsair', while the 125th TFS, Oklahoma ANG sent a dozen aircraft from Tulsa to RAF Waddington for participation in Exercise 'Central Enterprise'. That turned out to be the continent's last Air Guard Corsair sojourn for operational purposes.

Drawing down the active-duty force made available surplus F-16C/Ds for Guard units. That and the decision not to proceed with the upgraded YA-7F beyond prototype form put the writing on the wall.

Corsair II numbers dwindled as airframes were sent to the 'boneyard', October 1993 seeing the final farewell when Oklahoma's 125th Fighter Squadron — the 'Tactical' had been dropped from unit designations the previous year — relinquished its last A-7D.

Participation in large-force exercises, including those in Europe, constantly showed the Air Guard Corsairs and their crews to be at the top of their game. Their training back home was top-notch, and the fact that personnel stayed in their jobs for longer in the ANG than the active-duty air force is often cited as another factor. A certain independent-minded mentality came into play, too. "We tried to be innovative [...] in designing new tactics within operating limits and regulations, just to test and see how they worked", said Mason Whitney. "When I was on active duty, you tended to follow a script. In the Guard, we were given the latitude by our commanders to try new things."

As Whitney reflected, "I never had a bad day when I was flying the A-7 in the Air Guard. It was the best of all worlds, I thought". Whether for operations in the European theatre or elsewhere, this was still a capable, dependable jet. Had war broken out and real-world deployments taken the place of the 'Checkered Flags' and 'Creek Corsairs', the evidence all suggests it would have made a very valuable contribution in facing off against the Warsaw Pact.



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The December 2024 issue of *Pilot* magazine features a newly restored Mk IX Spitfire as its cover star. Stefan Löfgren took to Norwegian skies with former SAS colleague and one of Europe's most experienced warbird pilots, Rolf Meum, to fly the impressive two-seater aircraft.

It's back to the future for a full flight test of the weird and wonderful VariEze. The quirky but high-performing and efficient design that brought composite structures to homebuilt aircraft still looks sensational today, almost half a century after it first appeared. Plus, *Pilot's* tips and strategies for dealing with engine failure after takeoff (EFATO).



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meets

RUPERT CLARK

KEY/BEN DUNNELL



The ex-RAF Tornado GR1 pilot and Gulf War PoW whose ‘impulse buy’ of a Tiger Moth was one of the best things he ever did

WORDS: BEN DUNNELL

In their attitudes to flying, military pilots are far from being a homogenous breed. There are those for whom, primarily, it’s a profession. Nothing wrong with that. They may continue to pursue it in the commercial world, and good luck to them. You also encounter those for whom the military side is the be-all and end-all, not to be surpassed. But another group simply loves it, and cannot resist taking any opportunity to be in the cockpit of *something*. They’re the ones you most regularly find in historic aviation, whether with their own aeroplanes or flying other people’s, often in parallel with their careers in the services and even more so afterwards.

Rupert Clark definitely belongs to that latter category. He flew some quite old aircraft during his time in the RAF, it must be said, but when at one stage it looked as though ground tours might keep him out of the air, he decided the best thing to do was buy his own DH Tiger Moth. This he followed with, of all things, a very rare Chrislea Super Ace. And now

he’s retired from his last role in the military, he’s intending to get both of them back out and about in 2025.

The part of his career for which Rupert is best-known dates back to the 1991 Gulf War, when he became a prisoner of war after his Tornado GR1 was shot down over Iraq. But beyond his recollections of that harrowing experience, he has a wealth of utterly fascinating stories from as far afield as Pakistan and Sri Lanka, and tales from closer to home that take in a very famous Russian test pilot. To hear them, I took Rupert for lunch at the Stag in the Lincolnshire village of Barkston, where we duly struggled to fit them all in before afternoon closing time.

The RAF loomed large in his familial background. “My father was a Hunter pilot in Germany, where I was born. Subsequently he was an instructor. Obviously, growing up in that environment I knew about the service, but I wasn’t in any way going there until I got to university”. That was St John’s College, Cambridge, where he read pure maths — and, more importantly



Back to freedom in Riyadh at the end of ‘Desert Storm’. With Rupert (second from top) are John Nichol, Dave Waddington and Robbie Stewart. PAUL HANNIFORD

Rupert rolls for take-off in his Tiger Moth, XL714/G-AOGR, during the last DH Moth Club rally at Woburn Abbey. BEN DUNNELL



Flying in a Hawk three-ship when different colour schemes were still the order of the day on No 4 FTS. Rupert is in the grey one, with Mike Saunders leading and Sean Perrett in the third aircraft. GEOFFREY H. LEE



When the Russian LII's display pair of Su-27s arrived at Valley in 1994, Rupert got to lead them in. GEOFFREY H. LEE





ABOVE, TOP TO BOTTOM: Muharraq-based Tornado GR1 ZD790, wearing *Snoopy Airways* nose art, during the 1991 Gulf campaign. RUPERT CLARK

A warm welcome for Russian test pilots Vladimir Loginovsky (second left) and Anatoly Kvochur. CROWN COPYRIGHT
MiG-23UB serial CTF 730 had not long been delivered to the Sri Lankan Air Force by the time Rupert flew it. VIA RUPERT CLARK

Back to Iraq, this time in No 25 Squadron Tornado F3 ZE961 during Operation 'Southern Watch'. RICHIE DIX

for this story, joined Cambridge University Air Squadron. By this point it had just switched to the Bulldog and was based at the city's airport. He found he greatly enjoyed flying, and went solo in short order. "But after two years my money had run out, and I was about to take out a loan to finance my third year at university when they came up with a cadetship. The easiest thing to do was to sign on the dotted line!"

This was 1979, the height of the Cold War, and the RAF was taking on huge numbers of new pilots. The RAF College Cranwell, Rupert recalls, "was like a big sausage machine. Every six weeks another lot moved on". He started on a short-service commission, subsequently transferring to a permanent one, and underwent flying training while 1982's Falklands conflict was proceeding. The traditional progression took him on to the Hawk, first with No 4 Flying Training School at Valley for advanced training, then the Chivenor-based No 2 Tactical Weapons Unit — "heaven in Devon", as he puts it.

Selected to join the Jaguar force, he went through No 226 Operational Conversion Unit at Lossiemouth, but actually ended up on the Canberra TT18 with No 100 Squadron. Wyton was its home, but there were regular deployments to Akrotiri, Cyprus, to support fighter units on armament practice camp with banner-towing, and up to Scotland to use the cable-deployed Rushton target for Rapier missiles to be fired at. "It was great flying", he says, "and it taught me how to survive in an old aeroplane."

The Tornado GR1, though, was still quite new when Rupert moved on to it. That involved type conversion with the Tri-national Tornado Training Establishment at Cottesmore, and following on from that the weapons stage on the Tornado Weapons Conversion Unit at Honington, all readying him for the posting to Germany. Laarbruch was his destination there, with No XV Squadron.

"I ended up going out there in '88", he says. "Everything was taken extremely seriously in terms of preparation, and your taceval [tactical evaluation] was the most important thing. You did about four big exercises a year, and your movement was restricted; you couldn't be more than 10 hours away from base, ready for an instant

recall. The flying was quite exciting as well, but you were absolutely concentrating on getting everything right.

“All the procedures were in place not just for you, but for the four squadrons at Laarbruch, and the base operating as a wing itself. Looking back, I only saw it at the time from the bottom looking up, but we had a good reputation amongst NATO of always being at the top of readiness. Obviously, ranged against us we’d got the inner German border and the Soviet forces based in East Germany and Poland. In Poland there were regiments of MiG-23 and -27 ‘Floggers’, and the story we were fed was that on ‘day one’ there would be these hordes of aircraft coming across the border and those would be our opposition. Many years later I got the chance to fly one...”

In the autumn of 1989, everything changed with the fall of the Berlin Wall. The following July, the Thatcher government announced its ‘Options for Change’ package of defence cuts, which sought to take advantage of the perceived post-Cold War ‘peace dividend’ and included the withdrawal of the RAF Germany Tornado squadrons. Within days, Saddam Hussein sent Iraqi forces into Kuwait, an event which set in train the next major confrontation. RAF assets began to deploy to the Middle East under Operation ‘Granby’ at the beginning of August, but it wasn’t until late November that No XV Squadron joined the growing arsenal of coalition air power in the Gulf region, taking up residence at Muharraq in Bahrain.

The UN’s deadline for Iraq to withdraw from Kuwait came, on 15 January 1991 — and, seemingly, went. “We stayed up and absolutely nothing happened. We didn’t have any instructions, so we went back to the hotel. A couple of hours later we were woken up: ‘Get into work.’ They pulled the curtains back and briefed us on the first night. Then they told us to go back to the hotel again, come in that evening, and that was what we were going to be doing. Of course, it was quite difficult to get some sleep.

“The first night [17 January] was a huge pre-planned mission. We were part of package H, which had 26 aeroplanes in it; we were the eight Tornados at the back end. The idea was we were dropping JP233 [airfield denial sub-munitions]. We wanted to be at the back of the package, because we didn’t want



LEFT:
One very happy Tiger Moth owner. The aircraft’s original RAF career included a period training Royal Navy pilots, long before it was transferred to the navy. VIA RUPERT CLARK

other people dropping weapons on top of ours for obvious reasons. It was then immediately obvious that we were going to do everything my training had been leading up to. The Tornado had been designed for that anti-airfield role in Europe — OK, we weren’t in Europe, but we were going to do that out in the desert.

“The start time was delayed, which had a knock-on effect for a couple

“ We were going to do everything my training had been leading up to ”

of people. It was, actually, extremely exciting. We walked out to our aeroplanes, started up and taxied in complete RT silence. This was round a big, major airport. We got to the end of the runway and, at the appropriate time, taxied on and got airborne. It was still quite warm, and while the Tornado was designed to carry this weapon load, it was right

at the top end of its weight limit. The aeroplanes lumbered into the air, using all of the, I think, 11,000ft of runway, straight into the night.

“There was no moon at all, and everyone had their lights on. There were hundreds of aeroplanes getting airborne all over the Middle East, and you could see them because of the flashing lights. We met up with our tanker... at the appointed time we were all full, we left the tanker and we started descending down to low level. We passed the ‘lights out’ point, and all the lights went out. There were still 600 aeroplanes around, but now you couldn’t see them. I think the stats were that something like 600 got airborne, and something like 200 or 300 crossed the border because quite a lot of them were support aircraft, tankers, EW or AWACS. We were quite happy, because we were the only ones at low level — so we thought.

“Down at low level, the aeroplane’s doing its stuff, you’re almost in complete darkness, night vision goggles on. As I say, there really wasn’t any moon at all. You could see the other aeroplane in formation with you about a mile away. Crossing the border was an ➤



ABOVE:
Unusual company
for the Tiger: parked
in front of a Tu-142
'Bear' in the museum
at Zhulyany Airport.

VIA RUPERT CLARK

interesting time; the first time you go into somebody else's country all tooled-up, ready to do business. We reached the first turning-point on the Iraqi side of the border, and then all hell was lit up on the horizon. There was no ambiguity about where our target was, put it that way, and we were still 70 miles away from it. We could see the effects of the first aircraft in the package.

"Attacking the airfield [...] there was so much 'triple-A' coming up it felt scary, it felt suicidal. But the fact is that we were accelerating to 550kt before getting to the airfield boundary. We had to fly manually to release the weapon; we didn't want a computer flying it while all those munitions were coming out of the pod. At some stage you realise all this stuff that's flying around is actually relatively safe, because if you can see it it's moving, and it's not going to hit you. Out the other side, of course now the aeroplane is the best part of five tonnes lighter, so it is shifting. We were going about as fast as we could at that stage.

"When we landed, there was complete euphoria about how well the sortie had appeared to go, and how well the mission had appeared to go because everybody else had

reported back. We heard the news that every single aeroplane that crossed the border had returned, and if that wasn't a marker of success for wave one of the war, what would be? Unfortunately, it wasn't true...

"It was as we went in to plan our second mission that we discovered John Peters and John Nichol hadn't returned from their mission. As I

“ There was a massive explosion off to the left-hand side of me ”

said, on that first mission there was a three-hour delay. They were planned to be on the second wave, which was initially also at night, but because of the delay they approached their target after sunrise in the morning, and clearly survivability wasn't so good for them. We all know what happened. It had a big knock-on effect on the squadron, to lose an aeroplane on the second mission. And while we were planning that

night another formation came back with only seven aeroplanes. All of a sudden, reality started to hit.

"For the next two weeks or so, I ended up seeing the development of RAF offensive air warfare. After four or five days we stopped using JP233, and part of the reason was the Iraqis weren't flying. I think there was good reason for that, and the good reason was that JP233 was very effective as a weapon, not necessarily with the runway cratering but the area denial. Even enemy pilots are quite sensible people, and they're not going to taxi round an airfield with bombs going off all the time.

"We then changed to night-time, medium-level, 'dumb' bombing, and the first one of those I went on was the day we first saw those awful pictures of John Peters and John Nichol — the faces of the Gulf War, if you like. We ended up going against the very same target as the first night, and learning how difficult it was to be effective at hitting targets properly from 20,000ft with 'dumb' bombing... To improve our effectiveness they brought out the Buccaneers with the laser 'spiking' pods, and we had a bit of time to train with them. After that we went daylight with laser-guided bombs



and our targets changed and evolved as that all happened.”

Unfortunately, Rupert’s participation was brought to a sudden end by the events of 14 February. “By then we knew air power alone wasn’t going to win the war, and Saddam was going to have to be pushed out. There was clearly an issue about how much of his air force he still had left, and also whether he would be able to use what he had left, so we started a small campaign of the daily bombing of hardened shelters... Our target on that particular occasion was a massive airfield complex [at Al-Taqqadum] to the west of Baghdad. It was the one area where they still had working radars and working missile systems, which they had been shooting at people but not guiding, or tracking people but not shooting.

“It just so happened that in my case, as I was running in to drop my bombs on the target, I did get the warning that a missile launch had been seen. The Buccaneer doing the ‘spiking’ for us called the launch, and said there were two missiles on the way. I had some other issues going on in the aeroplane at the time. One weapon was off but the

other one wasn’t, and as soon as I knew the Buccaneer wasn’t there any more and the bomb was not going to guide I was trying to get away as quickly as possible when I suddenly got the missile guidance tone. I was in a very hard left-hand turn, and I hadn’t seen anything, but all of a sudden there was a massive great explosion off to the left-hand side of me. Effectively the missile had over-corrected. This explosion completely disabled the aeroplane. I did then look vertically downwards and saw the second, which was coming straight at me at very high speed. It’s not often you get to look at something doing Mach 3, but they told me that’s roughly the speed it would have been doing — and it was clearly guiding as well...

“The second one exploded on the right-hand side, and I felt it was a bit further away, because it wasn’t quite such a loud noise as the first. But whereas with the first one a fragment had come in and completely destroyed the cockpit around me, the second one peppered the wings. There was lots of damage. There was no longer an aerodynamic surface out there. I could tell both engines

had flamed out, and there were a number of things I ended up doing. Obviously I was quite concerned for my navigator, who I was trying to get in contact with, and another thing was to get at least one engine relit if it was possible, so I went through the relight drills.

“There was a hole in the cockpit, and a lot of wind noise from that. Put the nose down, and obviously the aeroplane goes faster and the noise gets louder. Pull the nose up, the aeroplane slows down and the noise gets a bit less. I thought, OK, at least I know how to control my speed. But this little train of thought was interrupted by an extra warning on the warning panel. I didn’t really need to look at it, but I did. In trying to start the engine, all I’d done was set the aeroplane on fire. I had to go through a fire drill and try to put the thing out. But after that, the only way I was going to get out of the aeroplane was getting into a safe place to eject.

“On my way down, I made a plan of what I was going to do and where I was going to try and go to. About a kilometre away to the south-west there were some rocks, and I thought that was where I’d head for. I hit the ground so hard, but I knew exactly what I needed to do next in terms of what I needed to get rid of and keep. I was off and running in under a minute. But there was a great big beacon showing where I was, because there was an aeroplane on fire 200 yards away... I heard the noise of a motorbike and behind it there was a massive dust cloud of vehicles racing across the desert, so the game was up before it had even started.

“That was the start of three weeks of very unpleasant hospitality at the hands of Saddam’s regime. Initially it was military, but clearly much later on it was all his Ba’ath Party secret police. I think John Nichol probably does the best job of describing how unpleasant it was. And it was especially so one night when the prison we were in was bombed, being locked in a room when you can’t get out... But by then the Iraqi guards had disappeared, so all the pilots who had been taken prisoner were shouting through the doors to communicate.

“We moved prison a couple of times; we next had the delights of Abu Ghraib, which must be one of the most horrendous places on earth in terms of sanitation. It was clear it wasn’t just being done on

LEFT:
The 2013 visit to Ukraine included a Tiger display at Kyiv’s State Aviation Museum. ALAMY

BELOW LEFT:
The Tiger Nine team’s 13-aircraft ‘big wing’ in the Swiss Alps, led by Rupert’s old friend Ueli Leutert in his Jungmann. G-AOGR is right at the back.

UELI LEUTERT



ABOVE:
G-AOGR at St
Stephan, during
what Rupert says
was his best airshow
'long weekend'
away. OSSOBE

our behalf. That was how Saddam treated his own population. Then, suddenly, one morning there was a lot of gunfire. Things went silent, they came to move us, and of course you don't know what's going on and you start to get worried. We were taken back into Baghdad, and three or four days later we were released... The Iraqis turned up and sprayed us with perfume before handing us over to the Red Cross."

Tragically, Rupert's back-seater, Flt Lt Steve Hicks, was not among them. He had lost his life when their Tornado, ZD717, was hit by the SA-3 missiles. But Rupert was soon back in the saddle, flying again that August. Returning to Laarbruch, there wasn't long left for the GR1 in Germany, and when No XV Squadron disbanded he was posted — much to his pleasure — to No 4 FTS as a Hawk instructor at Valley.

During his time at the Anglesey base, he acted as flying display director for its 1994 airshow. On the lookout for interesting participants in the absence of the Red Arrows, he managed to attract the Test Pilots team from Russia's LII flight research institute, with Anatoly Kvochur and Vladimir Loginovsky in a pair of Su-27 'Flankers'. The deal, for what would today seem an absurdly cheap sum, was done the day before that year's Woodford show with the kind assistance of its organiser Alastair Robertson. "I ended up passing a brown envelope stuffed

with cash to a Russian in a car park", recalls Rupert. "No receipt."

They arrived a few days early and practised extensively. "OC ops said, 'These two are clearly giving us what we want. Take Anatoly for a ride in a Hawk'. So, I ended up flying him. It was fascinating. We went through all this procedure with the interpreters, making sure he understood all the safety aspects. Then we went flying. We did a bit of close formation, we did spinning, we did low-level, and we came back and did circuits. He'd

“The Tiger was a complete impulse buy, and I couldn't afford it”

had a look at the complete flight envelope of the Hawk. Afterwards we got out and started to chat, and he waved the interpreter away. He said, 'Don't worry, I can speak perfect English. Nobody has ever even invited me to fly a Western aeroplane...'

If that was out of the ordinary, so was Rupert's assignment from 1995, posted on exchange to the Pakistan Air Force Academy at Risalpur — its equivalent of Cranwell. "It is modelled on a British public school

of 1947", he smiles. "It is *Tom Brown's School Days*... but it produces a very, very disciplined military, and it produces lots of them". He instructed on the PAC MFI-17 Mushshak, a locally built development of the Saab Safari. "The temperatures in June would get to 50°, so we used to start at five o'clock in the morning and we'd be finished by half-past nine, 10 o'clock before going back for a well-earned siesta."

This exchange programme had come about because Pakistan was in one of its democratic periods, under the leadership of Prime Minister Benazir Bhutto — whom Rupert encountered at a function. "A remarkable woman. Such presence". Then, "a few months later I awoke and listened to the BBC World Service to hear there had been a military coup... I was thinking, 'Hang on a minute. Did I just hear that?' I rang my ultimate boss, really surprised I could get through because the first thing they do in those situations is cut the 'phone lines... He said, 'Go to work, act totally normally. Give us a call at 10 o'clock and tell us what the hell's going on'. In fact, it ended up with a peaceful transfer of power, though Bhutto's premiership was brought to an end.

Rupert returned to the front line as OC training on No 25 Squadron, flying the Tornado F3 at Leeming. This included deployments on Operation 'Southern Watch', back in the skies of Iraq to police the southern no-fly zone. From there, very fortunate to carry on his unbroken run of flying jobs, he went to the Central Flying School's Examining Wing as OC advanced examiners. Most of it was connected with flying and instructional standards for the RAF, but there were also overseas visits to assess foreign air forces at their request.

One was the Sri Lankan Air Force, and this was how, years after he was among those ranged against the type in Germany, Rupert got to fly a 'Flogger'. Specifically, it was the sole two-seat MiG-23UB in Sri Lankan service, which was only purchased from Ukraine during 2000 to aid with MiG-27 training. "It was a real handful to fly", he comments, "and a real challenge to control when the wings were moving. The Tornado was fantastic, because you could do anything with that wing lever and the machinery sorted it all out... In the 'Flogger', it was the pilot who had to do it. And I don't think I've



flown an aeroplane where the fuel goes down as fast. It's a big gauge — as you might expect, because it's really important — but it was visibly moving. If you're not on the ground after 40 minutes, you'll be on the ground after 45."

It was inevitable that a ground tour would rear its head at some point, so Rupert spent time in the Ministry of Defence working on the Hawk T2 and the broader Military Flying Training System programmes, followed by HQ Flying Training. Thinking he might not get another military flying posting — in fact, he did, as 'boss' of the CFS Examining Wing — during 2005 he found a Tiger Moth for sale on the internet and bought it. G-AOGR hadn't flown for five years, and had very few hours since rebuild. In an interesting history, this example had started out in the RAF as T6099 and been 'demobbed' onto the civil register before the Royal Navy acquired it, hence allocation of a late serial for a Tiger, XL714. During its latter service, while on the strength of Britannia Royal Naval College in the 1960s, it landed on HMS *Eagle*.

"It was a complete impulse buy", says Rupert, "and I couldn't afford it. It was before the big financial crisis, so all you had to do was walk into a bank in a suit and they would throw money at you. I took the loan and once I got out I thought, 'Why have I done this?' Actually, it was one of the best things I've ever done. First of all

I got Charlie Brown to teach me to fly it, and then I joined up with Jeff Milsom's Tiger Nine team."

Certain jaunts in the Tiger stick in the memory. A 2013 visit to Sevastopol in the Crimea, put together by members of the Air Squadron, was both unforgettable and unrepeatable — not least for its re-enactment of the 'Charge of the Light Brigade', over the original battlefield. And best of all was 2019's Tiger Nine trip to St Stephan in Switzerland. This takes us back to, of all places, Baghdad in 1991, when two MD-82s from Swiss carrier Balair were chartered by the Red Cross to take the newly released prisoners, including Rupert, back to

civilisation. "I toddled up to the front and asked to speak to the captain. After a while I asked, 'Do you mind if I make a 'phone call on the HF radio?' He set up a call for me to ring home... I've always kept in touch with that pilot, Ueli Leutert, over the years". When the 12 Tigers and single Moth Major arrived at St Stephan, Ueli went up in his Jungmann to lead them in.

And what of the Chrislea Super Ace, G-AKUW, one of just two airworthy examples of 18 built? This unconventional light aeroplane came up for sale, and Rupert — who'd seen it before — found the asking price too good to resist. He's not flown it a lot, but appreciates its qualities, despite many quirks. "There's too much metal in the thing, it's too big, and I would call it a triumph of hope over reality. It's an aeroplane that, if you initiate turns with the rudder and balance it with the ailerons, it flies very nicely. There's enough room for two people to sit side-by-side without interlocking arms, and there are some nice touches. If you're flying with somebody who is not a pilot, there is a fold-down board which covers the rudder pedals and makes sure they can't interfere with them."

What a contrast to the Grob Tutors which Rupert flew in his last RAF job, until retirement this past September. He was an elementary flying training instructor on East Midlands University Air Squadron, and also instructed some overseas students. What a suitable way to bow out after 45 years' service, given the highly international aspect to his career. And how fortunate so many trainees have been to receive tuition from this aviator of such depth and experience, whether in a Tornado or a Tiger Moth.



LEFT: Rupert's last ever RAF flight, some 45 years after the first: a three-ship Grob Tutor flypast for the RAF Cranwell annual reception in September. "We must have got the timing right", he says, "if we were over the top with the ensign half-way down the flagpole!"

VIA RUPERT CLARK

BELOW: The 1948-vintage Chrislea Super Ace G-AKUW has been owned by Rupert since 2014. Shuttleworth pilot Mark Sharp is in the right-hand seat here.

RUPERT CLARK



PAUL MANTZ

One day in 1950, US Navy serviceman and private pilot **Bob Allred** hitch-hiked from his base at NAS Miramar, California to Santa Ana. There he met the legendary movie pilot Paul Mantz, and a friendship ensued which saw Allred spending a good deal of time helping the famed aviator



Mantz (left) and Allred during an airshow at Santa Ana, where Mantz flew his red P-51 racer.

BELOW: Allred was allowed to photograph the film aircraft in Mantz's 'back lot' on condition the images didn't appear for at least another 20 years. These were some of the machines he found in the fenced-off compound at Orange County Airport, Santa Ana. In the foreground is Eberhardt SE5E — US-built SE5a — 22-296/N4488, which had appeared in *Hell's Angels* among many other movies. Behind it can be seen ex-American Expeditionary Force SPAD VII serial S248, as last used in *Captain Eddie*, the story of Eddie Rickenbacker, and then a Pitcairn Mailwing which flew in Ernest Gann adaptation *Blaze of Noon*. The type in German markings on the right is a *Hell's Angels* Fokker D.VII replica, which had hung from the ceiling of Grauman's Chinese Theatre in Los Angeles during the film's premiere in 1930.





Allred with the rudder of SE5E NX4488 at Santa Ana during his first visit. This aircraft ended up in the UK as G-BLXT, and is still registered as such to Flying A Services.



At Burbank in 1952, Allred inspects the history of P-51C racer NX1204, listing many Bendix Trophy wins and city-to-city records.



DH-4M-1 N3258 went on to be seen in the opening sequences of 1957's *The Spirit of St Louis*, painted as a US Mail aircraft. It is today owned by the Collings Foundation.



Prominent here in US Navy colours is the Boeing 100, N872H, which Mantz modified and painted to resemble a Curtiss F8C-2 Helldiver for 1949's *Task Force*; now, it's an exhibit at the Museum of Flight in Seattle. At the rear is ex-'Pancho' Barnes Travel Air Type R NX613K, the second 'Mystery Ship', which appeared in *The Tarnished Angels*; like the SE5E, this aeroplane is in private hands in the UK and kept in store.



Paul Mantz Air Services generally specialised in the maintenance of twin-engined Lockheed transports, but on one occasion Grumman G-32 NC1051 — originally built as the Gulfhawk III for Gulf Oil pilot Alford Williams — called in.

Have you got photos to contribute to Personal Album? If so, e-mail the editor at ben.dunnell@keypublishing.com

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WORDS:
JAMES KIGHTLY AND
DEREK BUCKMASTER



TOP: CA-9 Wirraway A20-664 as it appeared during its last days in RAAF service, with the serial applied in a stencil style. CHRIS SANDHAM-BAILEY

MAIN IMAGE: Wirraway II A20-176, a CA-3 model, is today registered VH-WWY and operated by leading Australian airshow pilot Paul Bennet. RAAF



The first Wirraway, A20-3, at Fisherman's Bend — written as such at the time, but today styled as Fishermans Bend — following installation of its military equipment, namely guns and radios. RAAF MUSEUM ARCHIVE

The Commonwealth Aircraft Corporation Wirraway was Australia's first mass-production aircraft, playing critical combat roles in the dark days of 1941-42, and seeing widespread use as part of the Australian contribution to the Empire Air Training Scheme. Wirraway is a word from the Woi Wurrung (Melbourne region) Aboriginal language meaning 'challenge'. The monoplane two-seater was a licence-built version of the North American Aviation BC-1, a relatively early model in the extensive NAA trainer series, which later included the T-6 and Harvard, and which incorporated a number of adaptations requested by the Royal Australian Air Force.

The design was selected following a global tour of aircraft manufacturers in 1936 by three RAAF officers commissioned by a syndicate of firms — Broken Hill Proprietary, Broken Hill Associated Smelters and General Motors-Holden — which had combined to set up an aircraft company, in recognition of the inevitability of war. The touring group was led by Wg Cdr Lawrence Wackett, a decorated Great War veteran and retired RAAF officer, who had designed and built several aircraft at the RAAF Experimental Section.

He was seconded from his job at Tugan Aircraft. Retired Wg Cdr Herbert C. Harrison had spent some years in the RAAF Directorate of Technical Services and worked closely with Wackett.

initially as an aircraft mechanic and later a pilot.

The assumption in the British Commonwealth and Empire, following the 1923 Imperial Conference, was that

“The choice of an American design was a political bombshell”

They were joined at the last minute by serving officer Air Cdre Arthur W. Murphy, who had also been decorated for First World War service in France,

the Dominions — primarily Canada, Australia and New Zealand — would always buy British aeroplanes. Regarded as the 'common equipment

policy', to achieve Empire-wide compatibility, the concept was actively protected by the Society of British Aircraft Constructors (SBAC) as a way of increasing sales by UK factories. Generally seen as a rule, this was despite an explicit exemption for aircraft and engine types in the original 1923 policy agreement. Furthermore, there was resistance from the UK government and manufacturers even to licence production of British types in Dominion countries. Despite this, Wackett's group also visited Czechoslovakia, Nazi Germany, France, the Netherlands, the UK and, ultimately, the USA.

They were seeking a two-seat general-purpose aircraft matched to an air-cooled engine, suitable for production in Australia at a new factory with inexperienced staff. This brief had been provided to them by AVM Richard Williams, the RAAF's Chief of Air Staff, even though the air force had not issued a formal specification.

Williams' requirements defined a general-purpose type with a crew of two, featuring a low-mounted monoplane wing and retractable undercarriage. He also stated the design could undertake army co-operation tasks, advanced training and air-to-air combat as a two-



Flying above the Werribee River near Laverton, Victoria, the sole Australian NA-16-1A (NA-32) shows its fixed undercarriage and flat windscreen. RAAF MUSEUM ARCHIVE

seat fighter. This matched expectations similar to the RAF's imperial policing types, and there was little idea of facing a skilled, well-equipped enemy air force. In many respects the requirement was for an updated Hawker Hart type — and indeed the Hawker Demon, in use with the RAAF, was the benchmark against which the proposed selection was compared.

The only types seen in the UK which matched Williams' two-seat, low-wing specification were the Armstrong Whitworth AW29 light bomber, a prototype of which was under construction to Air Ministry specification P27/32, and the Bristol Type 148 prototype to specification A39/34, the same as the Westland Lysander was to fulfil, although the tour group neither went to the Westland factory nor considered that high-wing design. On visiting his former colleague Frank Barnwell at Bristol, Wackett was disappointed that Bristol did not feel able to licence production of its engines to Australia, even though it had done so to several eastern European countries.

Upon returning from the overseas tour in July 1936, Wackett's party submitted their recommendations to the syndicate, which then presented the proposal to the Air Board. The selection was the North American NA-16 matched with a Pratt & Whitney Wasp single-row radial engine.

This choice of an American type was signed off by the Air Board, after a brief query,



Members of the CAC board and defence officials at the presentation of A20-102, the 100th Wirraway off the production line, on 7 September 1940. On the left is AVM Richard Williams; Flt Lt Hubert Boss-Walker, the CAC test pilot, is at far right, with AVM Charles Burnett fourth from left, and a smiling Lawrence Wackett sixth from left, with a camera case strap and Homburg hat. CAC VIA JAMES KIGHTLY COLLECTION

despite its apparent divergence from the 'common equipment' policy. However, it was a political bombshell for the Australian government. During earlier discussions to limit the influence of any foreign — including US — participation in the ownership of the new aircraft manufacturing company to be created in Australia, Australian Prime Minister Joseph Lyons had promised his British counterpart Stanley Baldwin that any such

firm would produce only British designs. Arguments of technical merit were of little use in the heated political negotiations.

The Dominions Office, with the British Air Ministry, proposed an alternative British design which it believed could meet the RAAF requirement: the Westland A39/34, which became the Lysander. However, the syndicate members withstood this political onslaught and the Australian government finally swung its

support in favour of the originally proposed choice, believing it the best technical solution.

Late in the design selection process, CAC purchased two different NAA production aircraft and provided them to the RAAF for comparative flight tests. They were the fixed-undercarriage NA-16-1A and the retractable-gear NA-16-2K. Confusingly, the latter is also known as the NA-33. The NA-16-1A arrived in Australia ➤



With flaps lowered, CAC test pilot Flt Lt Hubert Boss-Walker lands the first Wirraway, A20-3, at the end of its maiden flight at Fisherman's Bend on 27 March 1939. RAAF MUSEUM ARCHIVE



After being sold to the RAAF, the NA-16-2K was landed with the wheels up on at least two occasions — not surprising as retractable undercarriage was a new feature for air force pilots. RAAF MUSEUM ARCHIVE



Wirraways from the CA-1 contract on the production line at Fisherman's Bend. A20-20 has just received its Wasp engine.
CAC VIA RAAF MUSEUM ARCHIVE

in August 1937 and flew for the first time on 3 September from RAAF Laverton, Victoria, with the NA-16-2K arriving later in September. The 'fly-off' between the two confirmed the RAAF preference for the more advanced, retractable-undercarriage NA-16-2K. CAC also incorporated the latest design improvements made by NAA in California, which resulted in the BC-1 design there.

CAC set about the equipment changes requested by the RAAF to ensure commonality with British aircraft. The instrumentation and radio fit-outs were modified to use standard Air Ministry equipment. American guns, bomb slips and pyrotechnics were substituted with RAAF-standard items manufactured locally. Fasteners and small fittings were changed from NAA designs to British 'equivalents'. No alterations were made to the fasteners and fittings on the P&W engines, however.

The later British acquisition of the BC-1 as the Harvard was, in contrast, an 'off-the-shelf' purchase due to the shortfall in domestic advanced trainer production, notably the limited numbers of Miles Masters, coupled with the failure of the de Havilland Don. The Harvard was one of the first American aircraft ordered by the RAF when a contract for 200 was placed in June 1938, and much less adaptation to British equipment or standards was undertaken.

Into production

CAC was not only to mass-produce an aeroplane, but it had to start a national aircraft industry from scratch. Several attempts to build short batches of types had been undertaken in Australia, notably by Genairco — later Tugan Aircraft — but the limited market, the depression and a preference for buying British limited these efforts. The first overseas de Havilland subsidiary, de Havilland Australia, mainly provided spares and support pre-war. In 1936, at the formal incorporation of CAC, the backers were joined by ICI, the Orient Steam Navigation Company and the Electrolytic Zinc Company.

The fledgling CAC organisation built two new factories, one for the production of Wirraway airframes, with an airfield, and the second for the manufacturing of engines under licence. CAC selected Fisherman's Bend, a sandy, low-lying area between the Yarra River and Port Phillip Bay in Victoria. It was situated not too far from one of Australia's two major cities, albeit outside Melbourne's tram network. The swampy soil required extensive drainage works and deep building foundations. Construction was carried out by the same company which had recently built the General Motors-Holden factory nearby, starting in April 1937. Both plants were ready for occupation by September.

The creation of CAC's capability to manufacture modern warplanes had several extra benefits. It provided the nucleus of a trained workforce, which enabled the government's Department of Aircraft Production (DAP) to start up more efficiently in 1940, and ensured a network of suppliers which supported CAC and subsequently DAP with steel tubing, aluminium sheet and magnesium alloy castings. Another step-change was facilitating the skills and equipment established to produce the 650hp Wasp engine, which also enabled the rapid start-up of production of the 1,200hp Twin Wasp that was used in the DAP-produced Beaufort. Despite the relentlessly disparaging contemporary reports published between 1937 and early 1939 by C. G. Grey in *The Aeroplane*, the establishment of the privately owned CAC and production of the Wirraway was an undeniable success, and marked a watershed moment for the Australian aviation industry.

The first Wirraway, A20-3, made its maiden flight on 27 March 1939 from the factory airstrip at Fisherman's Bend in the hands of CAC's test pilot Hubert Boss-Walker. The A20 serial prefix, assigned by type in the RAAF system, started with A20-1 and A20-2 being allocated to the two NAA-built flight-test machines.

The initial three actual production aircraft, A20-3, -4 and -5, were handed to the RAAF on 11 July to undertake a comprehensive set of service trials. Upon their successful conclusion, the first four Wirraways officially delivered to the air force, A20-3, -6, -7

and -8, were handed over on 30 August 1939. By the outbreak of war in Europe on 3 September 1939, CAC had supplied seven Wirraways to the RAAF.

Forty Wirraways came under the terms of the CA-1 production contract, followed by 60 aircraft under CA-3. A series of minor design and equipment changes resulted in the CA-3 machines being differentiated as Wirraway IIs. Eventually, all Wirraway Is were transferred to training schools and MkIIs allotted to service squadrons upon delivery.

Follow-on orders resulted in contracts for the CA-5 (32 aircraft), CA-7 (100), CA-8 (200) and CA-9 (188), which were all MkIIs. A final deal for 135 more aircraft, numbered CA-16, saw minor design changes under a new specification, these being designated as Wirraway IIIs. The most significant difference in the MkIII was the incorporation at the factory of specialist wing flaps for dive-bombing. Sets of these 'dive-bomber' wings had previously been built under the CA-10A contract and retrofitted to earlier airframes. Wirraway production was unbroken — despite the wartime addition of the CAC Wackett and CAC Boomerang to the factory portfolio — from the first delivery of CA-1 contract aircraft in August 1939 until the final CA-9 example, A20-622, in June 1942.

The CA-9 contract was expected to conclude Wirraway production. However, another order was placed to cover anticipated wastage until the end of June 1945, resulting in CA-16 deliveries from November 1943 until July 1946 when A20-757 — the last of 755 Wirraways — joined the RAAF inventory.



The first four Wirraways handed over to the RAAF for delivery were A20-3, -6, -7 and -8, here at the CAC factory at Fisherman's Bend before the short flight to No 1 Aircraft Depot at Laverton, Victoria, on 10 July 1939. RAAF MUSEUM ARCHIVE

A view of the type's welded steel tube construction.

STATE LIBRARY OF VICTORIA



The Wirraway was a single-engine, two-seat, low-wing monoplane with a conventional metal structure. The undercarriage had a fixed tailwheel and inward-retracting mainwheels with brakes. Construction of the wing comprised a centre-section, carrying the main undercarriage, and a pair of mainplanes, equipped with fabric-covered ailerons and flaps. The tail surfaces comprised stressed-skin light alloy fixed units with fabric-covered light alloy rudder and elevators. All controls had trim tabs.

The fuselage structure consisted of a welded steel tube frame and light alloy panel covering around the fabric over light alloy frame sides. The Pratt & Whitney R-1340 Wasp geared radial engine was attached to the front of the frame with a firewall and engine mounting extension. A three-blade, constant-speed propeller was standard, except during early 1941 when manufacturing issues at de Havilland Australia meant two-bladed propellers were temporarily installed on the last

50 CA-9s. The Wirraway's geared propeller avoided generation of the famous Harvard and T-6 'rasp' on take-off.

The cockpit had full dual controls, the rear seat being rotatable, and provision for a ventral bomb-aiming prone position in the majority of

versions. The canopy covered both cockpits, with sections moving aft or forwards for the front and aft cockpits respectively. Training variants could have a blind flying hood fitted under the canopy. While the interior structure, cockpit and equipment layout were

essentially similar to the early Harvard type, there were numerous detail differences.

The two 0.303in Vickers MkV machine guns, with 600 rounds each, were mounted in front of the windscreen or, post-war, under the wings. A single 0.303in Vickers GO (gas-operated) No 1 Mk1 machine gun was positioned on a flexible mount in the rear cockpit. Beneath the wings were 18 bomb slips (what we would now call hardpoints), comprising four universal carriers, six light series carriers and eight mechanically controlled carriers. Bomb loads of up to 1,000lb could be carried, with individual bombs from 10.5lb up to 500lb, as well as pyrotechnics (flares) and supply containers in the shape of the 200lb Storepedo or 250lb CLE Mk1.

Wirraway A20-723 was adapted after the war for rocket firing training, fitted with Beaufighter-style rails on one wing and Mustang-esque zero-length rails on the other, as well as a gyro gunsight. Despite successful firing tests, the programme was cancelled. ➤

DATAFILE SPECIFICATIONS

POWERPLANT

One Pratt & Whitney R-1340 S1H1-G Wasp radial, 650hp

DIMENSIONS

Length:	27ft 12.5in (8.36m)
Span:	43ft 0in (13.11m)
Height:	8ft 9in (2.66m) tail down, excluding radio mast

PERFORMANCE

Maximum speed:	220mph (191kt, 354km/h) at 8,600ft
Cruise speed:	120mph (195km/h)
Range:	850 miles (1,368km)

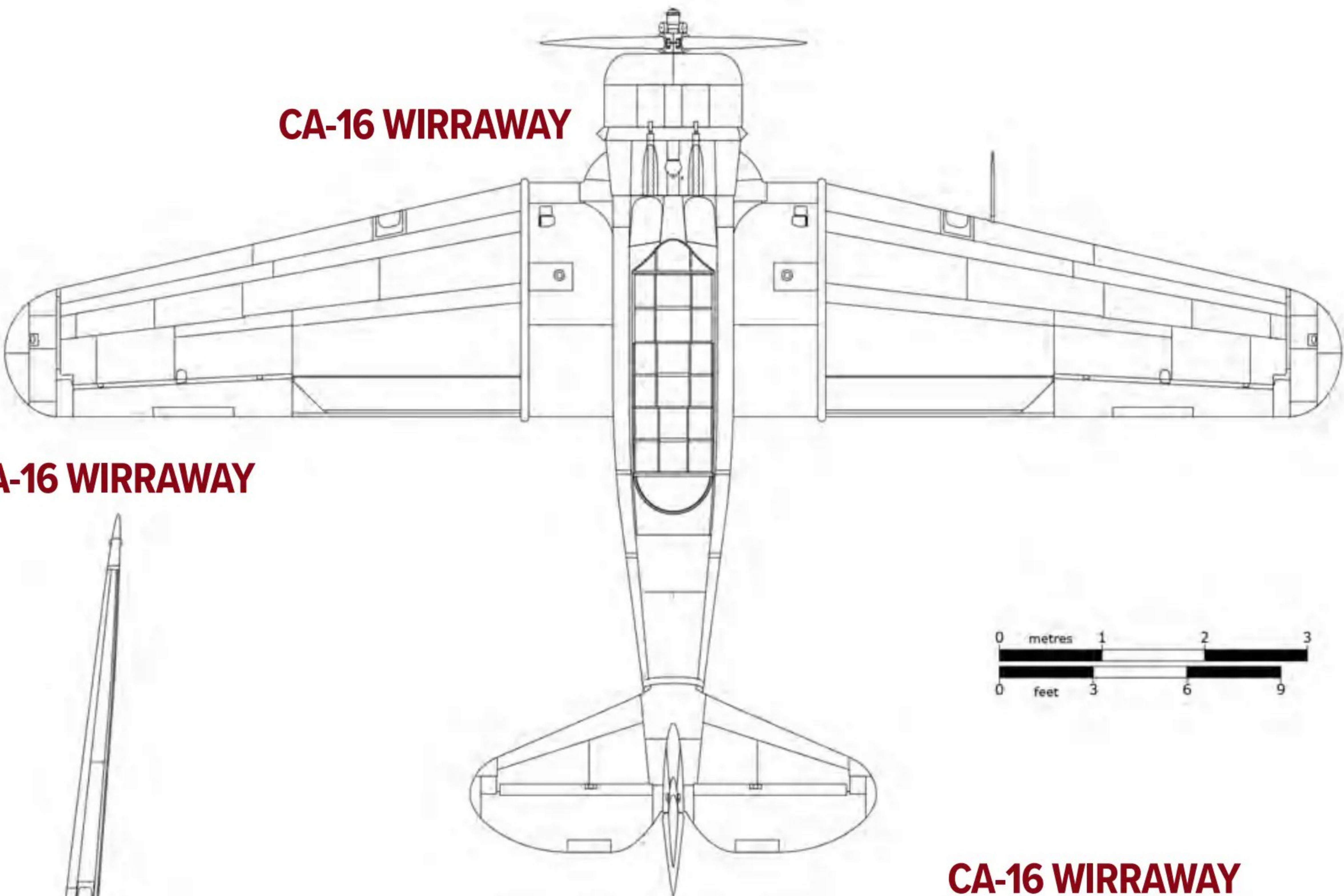
WEIGHTS

Empty:	3,895lb (1,767kg)
Loaded:	5,640lb (2,558kg) as day fighter, 5,747lb (2,607kg) for day reconnaissance, 6,597lb (2,992kg) as day bomber with overload

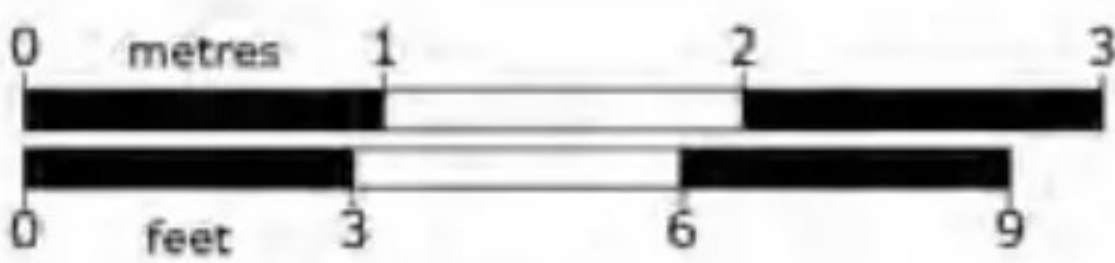
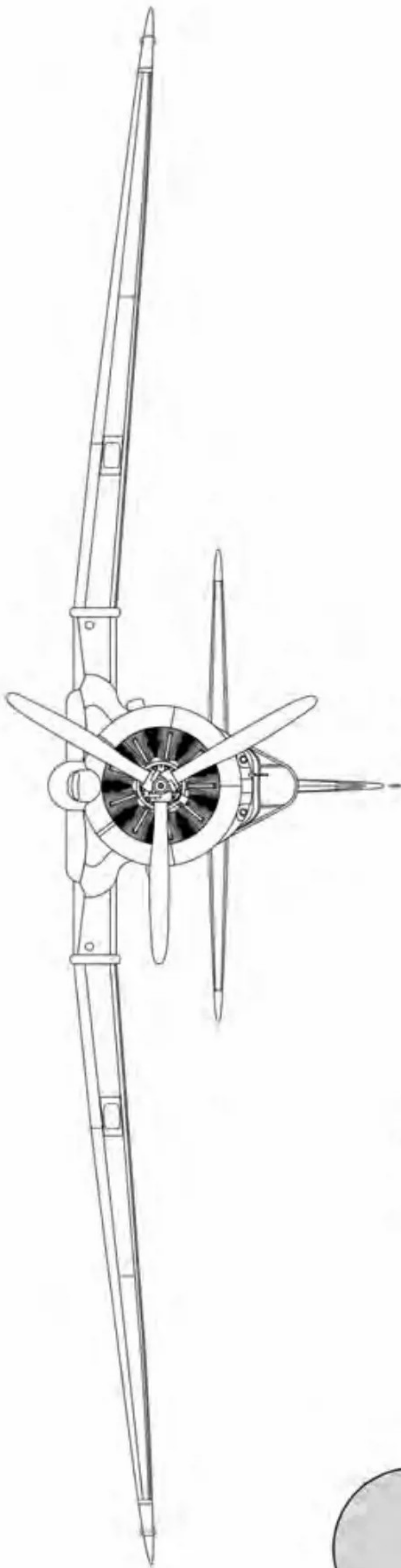
ARMAMENT

Two 0.303in Vickers MkV machine guns, 600 rounds each; one 0.303in Vickers GO (gas-operated) No 1 Mk1 machine gun; bomb load of up to 1,000lb

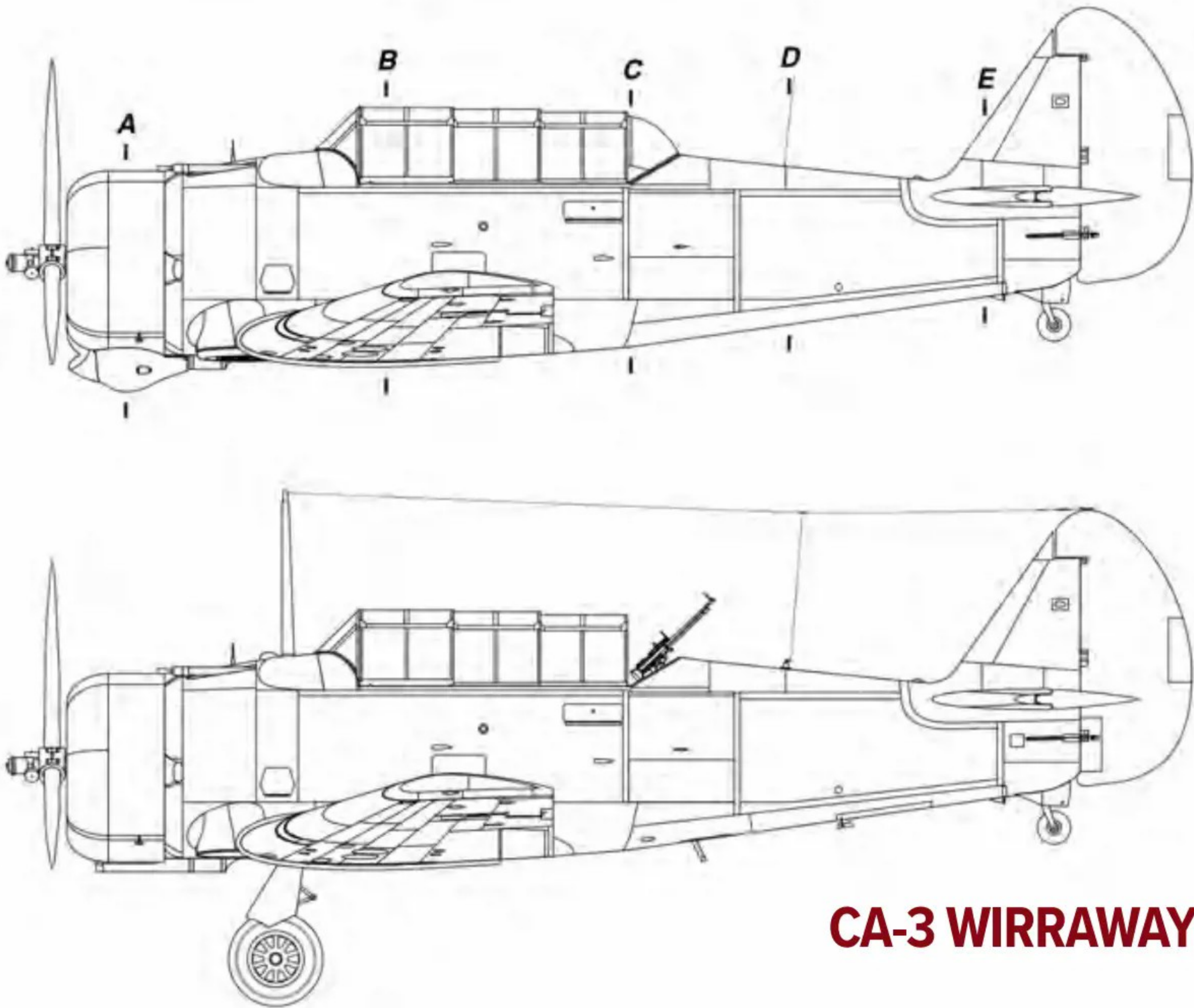
CA-16 WIRRAWAY



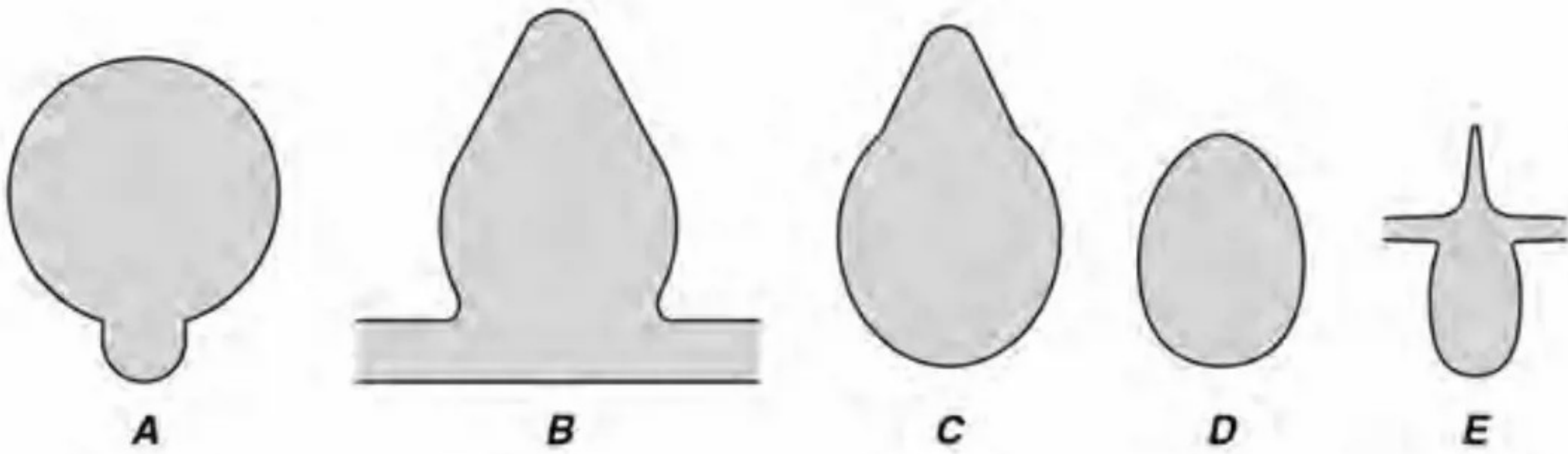
CA-16 WIRRAWAY



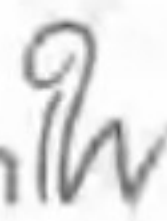
CA-16 WIRRAWAY



CA-3 WIRRAWAY



With thanks to
Derek Buckmaster

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No 21 Squadron aeroplanes A20-19, -21 and -22 early in 1940. A Williamson G22 gun camera is visible on the wing root of the closest aircraft. STATE LIBRARY OF VICTORIA



When it entered service in 1939, the Wirraway was the fastest and most heavily armed aeroplane in the RAAF inventory, but it was recognised as obsolete in combat in the high intensity of the Pacific War a scant two years later. Nevertheless it was highly versatile, carrying a larger bomb load than the RAAF's Avro Anson general-purpose bomber and maritime patrol aircraft, and capable of performing multiple roles including air-to-air gunnery, high-altitude and dive-bombing, photography, drogue-towing, flare-dropping and message pick-up. It also employed the same radio fit-out as the Anson, allowing for short-range and long-range R/T communication. The Wirraway introduced new technologies to the RAAF such as stressed-skin construction, constant-speed airscrews and hydraulically operated flaps and undercarriages. CAC supported this by running training courses for hundreds of RAAF fitters.

Introduction to service saw a number of accidents, the majority caused by pilots

getting to grips with a faster, higher-performance monoplane fitted with unfamiliar flaps, a retractable undercarriage and a constant-speed propeller. Other than a few engine failures the new type itself performed well.

No 12 Squadron was formed at RAAF Laverton, Victoria on 6 February 1939 as a general-purpose squadron. Under the command of Sqn Ldr Charles 'Moth' Eaton, it was intended to provide air defence for the city of Darwin, Northern Territory. On

establishment, the three flights were equipped with Ansons and Hawker Demons, the Demons being replaced on 1 September 1939 by Wirraways A20-3, -5, -6, -7 and -8 — the initial examples received on a squadron, and the first off the line.

The following day, they departed on the nearly 2,000-mile trip to Darwin, arriving after several stops at 10.30hrs on 5 September. The six aircraft flew across Darwin in formation and came to land at Ross Smith civil

aerodrome in Parap where the squadron was to be temporarily based, but the crowd of several hundred watched in horror as the first Wirraway to appear overhead, A20-5, stalled, went into a spin and crashed, killing pilot Fg Off Arnold Dolphin and observer Cpl Harold Johnson. The two airmen were the first Australians to lose their lives on Australian soil since the declaration of war on 3 September.

The second unit to receive Wirraways was established as No 22 (Cadre) Squadron in late April 1936 at RAAF Richmond, New South Wales, under the command of Sqn Ldr D. E. L. Wilson. Based on A and C Flights from No 3 Squadron, it used their Demons and de Havilland Gipsy Moths. Being a cadre squadron, half the personnel were drawn from permanent RAAF ranks and half from the Citizen Air Force.

On 1 July 1936 the title was changed to No 22 (City of Sydney) Squadron. It received Ansons during March 1937, and on 29 August 1939 the NA-16-2K (A20-2) arrived, along with four Demons to equip

No 23 Squadron (code T) kept its Wirraways highly polished, as with these in 1942. MOORABBIN AIR MUSEUM ARCHIVE





CA-9 A20-496 in service with No 23 Squadron during 1943. CHRIS SANDHAM-BAILEY

B Flight. Only a fortnight later, on 12 September 1939, the NA-16-2K was landed wheels-up, sustaining damage to the propeller and cowling. Four Wirraways, A20-4, -10, -11 and -12, and one Demon followed on 7 October 1939 from RAAF Laverton. D Flight was formed that December to carry out the intermediate training of air cadets, while the first two camouflaged Wirraways to come from the factory, A20-23 and -24, were received at Richmond on 7 December, joined by A20-47, -51, -56 and -57 in May 1940.

Eight Wirraways of No 22 Squadron flew to No 1 Armament Training School at Cressy, Victoria, on 1 October 1939 to assist with the instruction of 35 air gunners. The squadron also commenced training in level and dive-bombing, and air-to-air gunnery with beam and quarter attacks being carried out by each of its pilots.

During November and December the squadron was involved with the upgrade of Sydney's defences, including co-operation in air raid precaution and anti-aircraft exercises and photographing army transports in camouflage efficacy 'cover tests.' December

saw coastal patrols, including flying protection for RMS *Queen Mary*, trooping in Australian waters. Five aircraft were sent to Moruya, 150 miles south of Sydney, to stand by as a 'striking force.' Through 1941 there was army co-operation, dive-bombing, parachute-dropping and photography work before, in April 1942, re-equipment with Douglas Boston bombers. The last Wirraways passed to No 24 Squadron on 1 June.

No 25 Squadron also received some Brewster Buffaloes for the defence of Perth, amid concerns of a possible Japanese invasion. The squadron was re-equipped with Vultee Vengeance dive-bombers in August 1943.

A new No 23 Squadron was created on 6 February 1939 at Richmond, its Ansons undertaking maritime patrols and co-operation with Royal Navy and Royal Australian Navy ships. After transferring to

August 1940. Another interesting interlude occurred in February 1942, when 20 officers of the US Army Air Corps' 49th Fighter Group were given dual instruction on Wirraways at Archerfield.

Sgt C. Herring, flying one of two Wirraways on a security patrol of the sea approaches to the Brisbane River, sighted a suspected enemy submarine 50 miles off Brisbane on 24 March 1942. He attacked, dropping two 100lb anti-submarine bombs, afterwards observing a brown substance on the surface of the water. This was believed to be the first strike by an RAAF aircraft off the east coast of Australia.

In June 1942 the squadron moved to Lowood, Queensland, testing its mobility capability by operating 18 aircraft only four hours after arrival. Operations out to sea were extensive; that July, 44 anti-submarine patrols were carried out, at sunrise, sunset and during full-moon nights. By the end of July 1943 the unit had transitioned to the Vultee Vengeance, after an abortive attempt to convert to Bell P-39 Airacobra fighters.

Wirraways were often used as utility aircraft, for errands and weather observation

“The brave Wirraway pilots vainly tried to fight off Japanese bombers”

No 23 Squadron was initially formed at Laverton, Victoria on 3 May 1937, and moved to Pearce, Western Australia on 10 March 1938 where it was retitled as No 25 (General Purpose) Squadron as of 1 January 1939. Equipped with Avro Cadet trainers when war was declared, they were replaced with armed Wirraways, operating in convoy protection and anti-submarine roles off the Western Australia coast around Fremantle and Rottnest Island. When Japan entered the war,

Archerfield, Queensland — as the first RAAF squadron based in the state — at the end of August, on 15 November the squadron received four Wirraways, A20-13, -14, -15 and -16, from Laverton. It undertook co-operation with local army and naval units as well as naval escort duties, interception exercises and reconnaissance flights.

Prime Minister Robert Menzies and AVM Charles Burnett, the Chief of Air Staff, inspected the squadron on 1



Bombing practice on a range target in New South Wales. STATE LIBRARY OF VICTORIA



A20-444 is the nearest of these No 23 Squadron Wirraways on a coastal patrol from Lowood, Queensland in early 1943, bearing non-standard camouflage and markings. MALCOLM LONG COLLECTION

flights. Several were allotted to USAAC and RAF units operating in Australia, and at least two received US markings.

Pacific War

By the time war broke out in the Pacific in December 1941, the RAAF still found itself with no front-line fighter aircraft. Wirraways of Nos 21 and 24 Squadrons were used as fighters to defend Malaya and Rabaul respectively.

The third squadron to receive Wirraways was No 21 Squadron, which became the first to operate them outside Australia. Lacking any front-line fighters to aid in the defence of Singapore, 18 Wirraways were shipped to Malaya as a stop-gap measure in August 1940. As the rearmament of forces in the area gathered pace, and No 21 Squadron received Buffalos, 10 Wirraways were sent back to Australia. The six which remained in Malaya were transferred to an RAF operational training unit stationed at Kluang.

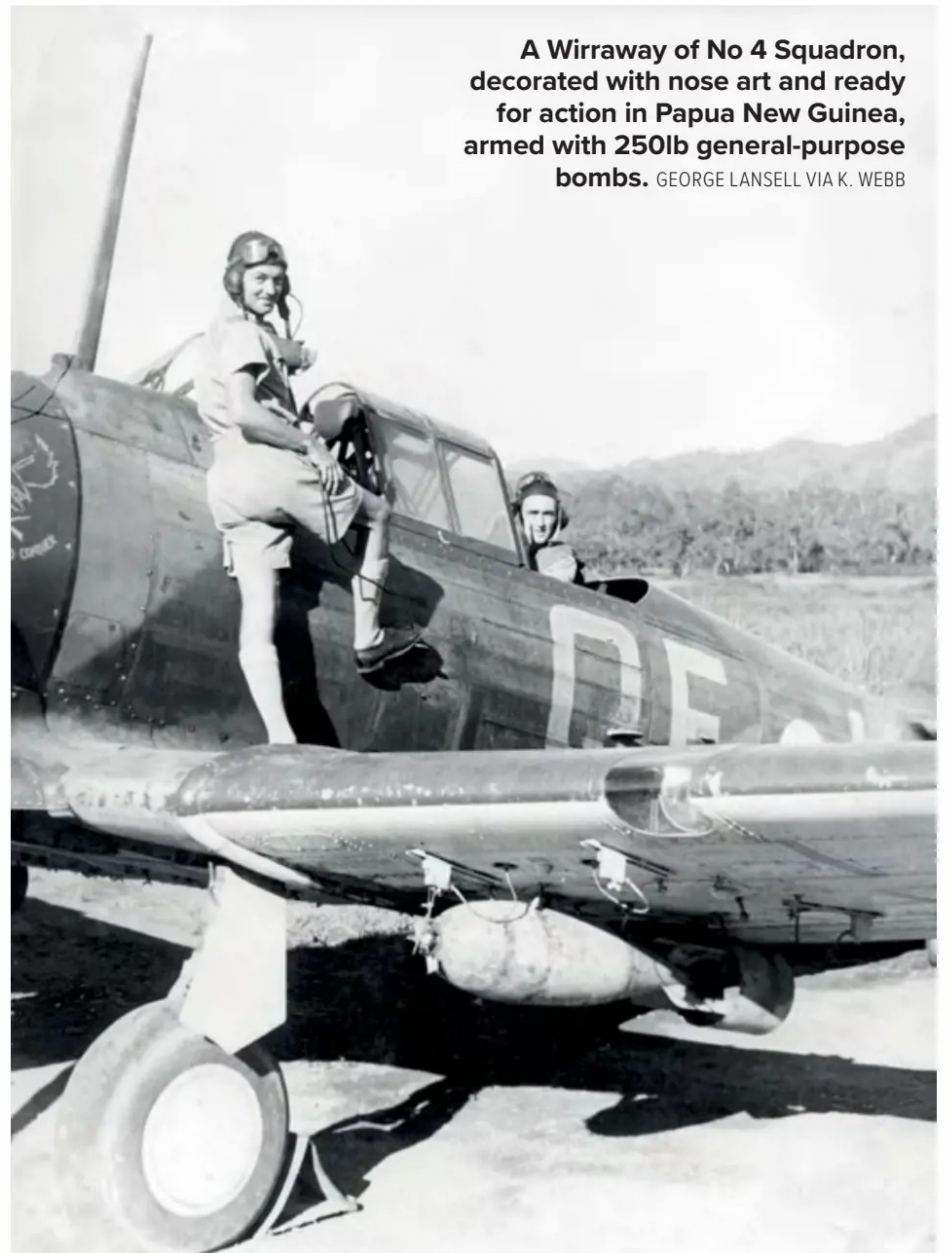
Over New Britain, the brave pilots of No 24 Squadron vainly attempted to fight off multiple waves of Japanese bombers protected by vastly superior Mitsubishi A6M Zero fighters. On 6 January 1942, they sought to intercept Japanese seaplanes flying high over the island; only one Wirraway managed to engage an enemy aircraft, marking the first air-to-air combat between RAAF and Japanese forces. The commanding officer, Sqn Ldr John Lerew, earned a place in RAAF history by sending several acid cables to Australian headquarters in response to the unfulfillable demands being placed on his unit, stating, "The Empire expects much, repeat much, of a few."

Two weeks later, on 20 January 1942 the squadron sent eight Wirraways into action against a force of more than 100 Japanese bombers and fighters. Six aircraft were destroyed or damaged, six aircrew killed and five wounded in the action. Lerew had requested "six modern fighters" — there were none in the whole of Australia, but he was told nevertheless to keep his airfield 'open.' He replied with the mythic

gladiator's cry "Morituri vos salutamus" (We who are about to die salute you). The unit's aircraft withdrew south to Townsville on 22 January, and Rabaul fell soon after. Despite orders to turn his airmen into infantry, Lerew was successful in evacuating the majority of his valuable, experienced air and groundcrew back to Australia.

As the fighting moved down the Malay Peninsula, former No 21 Squadron Wirraways were pressed into combat against Japanese ground forces on army co-operation duties, joining the extemporary Y Squadron, RAF. On 19 January 1942, escorted by Buffalo fighters, five Wirraways accompanied Netherlands East Indies Army Air Force Martin 139WH-2 bombers — more commonly known as the 'Glenn Martin,' developments of the Martin B-10 — and attacked Japanese troop concentrations around the Muar area on the west coast of Malaya. Piloted by New Zealanders with Australian observers, these aircraft had some limited successes, but, lacking armour and performance, suffered heavy losses. One Wirraway was shot down by Japanese fighters and three were damaged.

While the Dutch bombed the Japanese headquarters, the Wirraways attacked launches and troop-laden barges that were being towed across the river. The crews of these aircraft had fitted them with an ingenious 'soup plate' siren on the starboard fuselage side, and they appeared to demoralise the enemy. As the strike began, numerous Japanese fighters retaliated. The Buffalo pilots engaged, and in the battle Sgt Parsons was killed when his aircraft was shot down. All four 'Glenn Martins' were



A Wirraway of No 4 Squadron, decorated with nose art and ready for action in Papua New Guinea, armed with 250lb general-purpose bombs. GEORGE LANSELL VIA K. WEBB



This No 4 Squadron aircraft carries a 200lb CLE stores canister, one of 67 dropped, filled with comforts from the American military for the 7th Division, Australian Army, fighting in the Gusap area in Papua New Guinea during Christmas 1943. JAMES KIGHTLY COLLECTION



Wirraways from No 21 Squadron, with the short-lived high-visibility markings, on an armed patrol over Malaya. ALAMY

also downed, as was Wirraway A20-72, its pilot and observer landing by parachute and being brought in by an Australian army patrol. It was not entirely one-sided, as Flt Lt Kirkman, protecting the Wirraways, dived his Buffalo in pursuit of three enemy fighters and claimed one.

On 23 January 1942, the Wirraways of Y Squadron were withdrawn from the collapsing front back to Singapore, closing the Malayan chapter of the type's front-line service.

Army co-op

Wirraways were again called into action in Papua New Guinea in late 1942, but this time in an army co-operation role for which they were more suited, and with some degree of Allied air superiority.

On 6 October 1942, the Australian commander in the field, Gen Thomas Blamey, made a request for an army co-operation squadron equipped with comparatively slow aircraft. He quoted an earlier request by Brig Gen Walker suggesting a unit equipped with Wirraways, Boomerangs and Tiger Moths, but this proposal met with some opposition at general headquarters, as the risk of casualties was high. Blamey agreed but the squadron was required urgently. Gen Douglas MacArthur told Blamey he had been informed it was unlikely Boomerangs would be available for service within three months, and the squadron, equipped with Wirraways, would therefore

be transferred to New Guinea as early as possible.

The first three Wirraways of No 4 Squadron reached Port Moresby on 7 November 1942, led by their commander, Sqn Ldr Geoff Quinan. By the 21st the unit had been established at Berry aerodrome outside Port Moresby, with 18 Wirraways on strength. Its tasks were aerial reconnaissance, photography, artillery spotting, message and supply-dropping, strafing and dive-bombing and distribution of propaganda leaflets. To this 'maid-of-all-work' list was added the vital weather reconnaissance job. Supply-dropping, so crucial for Australian troops on the

Grabbing the opportunity to undertake a difficult front-quarter diving attack, Archer fired a five-second burst of 50 rounds per gun. He said after landing back at base, "it had red spots on it, so I gave it a burst and it appeared to fall into the sea". Squadron headquarters received an understandably elated signal from Dobodura which read, "Archer has shot down one Zeke, repeat one Zeke. Send six bottles beer". The precious beer was sent.

In fact the Japanese fighter was not a Mitsubishi A6M 'Zeke' as Archer had assumed, but a Nakajima Ki-43 'Oscar'. Australian 2/14th Battalion

“Archer said, ‘I gave it a burst and it appeared to fall into the sea’”

Kokoda track, was dependent on favourable conditions. Wirraway pilots therefore sortied to the Kokoda Gap, specifically the actual pass between the peaks at an altitude of 7,500ft instead of the mountain range's 12-13,000ft. Here they circled, signalling the weather status back to New Guinea Force HQ, and whether it was possible for aircraft to land at Kokoda.

The most remarkable moment in the Wirraway's history occurred on 26 December 1942, when Plt Off J. S. 'Jack' Archer and Sgt J. F. Coulston were cruising in A20-103 and spotted a Japanese fighter 1,000ft below.

soldiers swam out to the wreck two days later and retrieved Hiroichi Fuji-i's body from a depth of 3m. They reported the pilot had probably been killed instantly by a shot to the head. His personal effects, including bank notes of one rupee, \$10 and 10 Dutch guilders, were sent to the local Australian army intelligence unit. This was the only aerial victory recorded by the Wirraway or a Boomerang, and Wirraway A20-103 is today in the Australian War Memorial collection.

Formed in January 1941 at Laverton with six Wirraways from No 22 Squadron, No 5

Squadron was the second army co-operation unit to see action in Papua New Guinea, arriving at Torokina on 10 November 1944.

Wirraways shared tactical reconnaissance missions with Boomerangs, but the Wirraways proved more capable, carrying more smoke bombs for marking — up to 14 — and often taking army observers in the rear seat. Other duties included dive-bombing and strafing attacks, and the ranging of army artillery and naval gunnery fire. Supply dropping was a regular activity. Message pick-ups were trialled, but never successful. Wirraways also conducted photographic reconnaissance, using the type's standard vertical camera mount, as well as some aircraft modified for oblique photography through a hole in the port rear fuselage access hatch.

Two Wirraways, one flown by pilot Flt Lt Cory and his observer Fg Off Fiskin, the other by Flt Lt Reynolds with Fg Off Meadows, were called in on 26 April 1945 to help clear a Japanese roadblock on the main Buin track in the Hiru Hiru area of Bougainville. Communicating with Australian ground troops, the Wirraways each dropped eight 30lb smoke bombs to mark targets onto which Corsairs from Nos 14, 22 and 26 Squadrons, Royal New Zealand Air Force dropped 31,000lb of bombs over a three-hour period, wrecking the Japanese defence.

Training

Despite the wide range of roles the Wirraway was intended and used for, it will mainly be remembered as Australia's main advanced single-engine trainer, instead of the NAA Harvard otherwise used across the British Commonwealth.

Nine months after the first Wirraway flew, the Riverdale Agreement was signed on 17 December 1939 in Ottawa, Canada, establishing the British Commonwealth Air Training Plan (BCATP), also known more commonly in Australia as the Empire Air Training Scheme (EATS). This was of major significance to the RAAF and CAC, as the Australian government agreed to provide 1,728 aircraft, including 315

A combat-weary No 4 Squadron Wirraway showing a bomb-toting variation on the squadron's eagle nose art. JAMES KIGHTLY COLLECTION



A group of Wirraways from the Base Squadron at Point Cook, Victoria, accompanied by CAC Winjeel A85-406, between June 1957 and July 1958. The Base Squadron aircraft were flown by pilots from a range of units including the RAAF College, No 1 Advanced Flying Training School and the Royal Australian Navy. COLIN PECK VIA KEITH WEBB



Wirraways, to fulfil the training of so many pilots. The cost of the first 233 Wirraways was met by the British government.

Courses at the Service Flying Training Schools consisted of two streams, intermediate and advanced; the total duration varied during the war as demand for aircrew rose and fell. Initially running for 16 weeks, the course was cut to 10 weeks — which included 75 hours' flying time — in October 1940, lengthening as the demand for fresh pilots

waned, peaking at 28 weeks in June 1944.

The first Wirraways allotted for training duties joined No 2 Service Flying Training School at Forest Hill, Wagga Wagga, New South Wales in October 1940. Larger numbers arrived with No 3 SFTS at Amberley, Queensland in January-February 1941.

At the peak of the scheme, 356 Wirraways were allotted to training schools including Nos 1, 2, 5 and 7 SFTS, the Central Flying School, Nos 1 and 2

Armament Training Schools, Nos 2, 4 and 8 Operational Training Units and the School of Army Co-operation. The largest user of Wirraway trainers was No 5 SFTS at Uranquinty, New South Wales. Its highest allocation was 162 on strength plus 81 in reserve. A total of 1,515 pilots passed through Wirraway training there in 34 course groups between November 1941 and June 1945.

The airfields at these Service Flying Training Schools were unpaved paddocks, and dust

quickly became a major problem for Wirraways operating in such conditions. This was particularly the case for No 5 SFTS at Uranquinty. Fine dust sucked into the carburettors then entered the cylinders, causing rapid wear of the pistons and cylinder liners.

CAC service engineer Ewart Chennery visited RAAF units, and at the end of January 1942 he reported that only 14 per cent of the Wirraways at No 5 SFTS were serviceable, mostly due to engine wear. An engine overhaul workshop was established at No 5 Aircraft Depot, RAAF Forest Hill, to service worn powerplants.

Numerous trials were carried out and changes made to the air intakes and air cleaners. The first, in late 1940, was a redesigned lower cowl air scoop incorporating a second air intake below the main intake. The second scoop fed air to the oil cooler, leaving the main scoop to supply only the cold carburettor air. A filter element was added at the front of the main scoop to try and remove dust from air going to the engine induction system.

An experimental air cleaner insert was developed by No



No 2 SFTS aircraft on a formation training sortie out of Forest Hill, New South Wales. A20-142 was a CA-7 model, which suffered two serious mishaps while with the unit in 1941 and '43. STATE LIBRARY OF VICTORIA

2 Training Group at Wagga, fabricated with felt and laminated with ‘wood wool’ (wood shavings) in wire mesh, to replace the standard filter insert. It was fitted to a No 5 SFTS Wirraway for 30 hours of operation without being washed or removed, and the aircraft and engine performance carefully monitored. Though viable, the system was not adopted, but by October 1942 a new lower cowl design was developed following discussions between the Directorate of Technical Services, Lawrence Wackett of CAC and Ellis Wackett, the Air Member for Engineering and Maintenance, who was Lawrence’s brother. This featured a raised intake and duct for carburettor air.

At an Air Board meeting held on 19 November 1942, the Air Member for Supply and Equipment calculated that cylinder wear due to dust ingestion on Wirraways was costing in the vicinity of AUSE5,000 (roughly the same UK Sterling value) per week for eight months of the year, and 20-25 per cent of this could be saved with the new type of filter. It was estimated that 500 sets would be required, at a total cost of AUSE17,500 (AUSE35 per aircraft). The lower engine cowl on all aircraft was replaced with a new lower cowl incorporating a raised intake for cold carburettor air. All MkIs and IIs in service, A20-3 to A20-622 inclusive, were modified, with A20-623 onwards — MkIIIs delivered under the CA-16 contract — being altered by the manufacturer as they were produced. New lower cowls were shipped direct to RAAF units from the supplier, Wunderlich, in Sydney.



A20-469 was transferred to the Royal Australian Navy during October 1952, and later received the code 902. RAN

Post-war

Following the war’s end, a few aircraft continued in service as trainers at Uranquinty and Point Cook, Victoria, while small batches were transferred to the Royal Australian Navy’s newly formed Fleet Air Arm in 1948, others being stored. A total of 24 Wirraways were issued to the navy between November 1948

(City of Sydney), 23 (City of Brisbane), 24 (City of Adelaide) and 25 (City of Perth) Squadrons. They fulfilled diverse duties including training and refresher flights, weather checks and overwater shark patrols.

One Wirraway had a somewhat embarrassing role in the infamous ‘runaway Auster’ saga of 30 August 1955. An Auster J/4 Archer managed to take off

unable to change the weapon’s magazine as his unprotected hands had frozen to it. The Auster was shot down by two RAN Sea Furies over the sea after flying for two-and-a-half hours, and following another abortive RAAF attempt where the guns on a pair of Gloster Meteors failed after only a few rounds.

After the CAC Winjeel entered service, the RAAF phased out its remaining Wirraways with a farewell flypast on 4 December 1958 at Point Cook. The last military flight was on 27 April 1959 when CA-16 A20-686 was flown to Tocumwal for disposal. However, when the RAAF’s No 100 Squadron heritage unit was formed in 2021, the Temora-based Wirraway A20-653/ VH-BFF was one of the aircraft that re-entered military service.

Dozens of Wirraways came to an inauspicious end as targets for students at the RAAF School of Land-Air Warfare, and hundreds were eventually dismantled and sold to scrap metal merchants at Tocumwal. Others were purchased by aerial agriculture companies, and CAC bought 61 for use in the production of its Ceres agricultural aircraft, the design utilising some Wirraway parts. When the Ceres programme did not yield the hoped-for sales, 36 surplus airframes and parts were sold by CAC, becoming the foundation of the type’s survival in preservation.

“The gunner’s unprotected hands had frozen to the magazine”

and November 1953, and an additional six airframes were provided for spares. They served with 723 and 724 Squadrons at Naval Air Station Nowra, New South Wales, being retired in 1957.

Three Wirraways were shipped to Japan for use by the British Commonwealth Occupation Forces with No 77 Squadron, No 81 Wing. At least one of these made liaison flights to Korea with No 30 Transport Unit following the outbreak of the Korean War in June 1950.

Wirraways served with Citizen Air Force units alongside CAC Mustangs, flying with Nos 22

without a pilot from Bankstown, New South Wales, and a frantic effort was made to send an armed aircraft to shoot it down as it circled to 10,000ft, heading towards Sydney. The RAAF despatched a Wirraway from Richmond, its observer armed with a Bren gun — however, at that altitude, the ‘gunner’ was



CA-16 A20-692 was purchased by Super Spread Aviation and converted for insecticide spraying as VH-SSF. THE COLLECTION

DATAFILE // WIRRAWAY VARIANTS	
Wirraway I	Supplied under one production contract, CA-1 (40 aircraft); identifiable by corrugated skin on vertical stabiliser
Wirraway II	Supplied under five production contracts, CA-3 (60 aircraft), CA-5 (32 aircraft), CA-7 (100 aircraft), CA-8 (200 aircraft), and CA-9 (188 aircraft); numerous minor improvements and changes
Wirraway III	Supplied under one production contract, CA-16 (135 aircraft); identifiable by enclosed rear canopy and replacement of radio mast in front of windscreen with whip antenna behind rear cockpit; all earlier models progressively upgraded to MkIII standard CA-10 covered the development of a dive-bomber version of the Wirraway, but this was cancelled. The CA-10A contract took in the production and installation of dive-bomber wings fitted with dive brakes. A total of 115 aircraft were given these wings in late 1942 and early 1943, the project carried out by CAC in conjunction with Clyde Engineering of New South Wales and Ansett workshops at Essendon and Mascot, Victoria. CA-20 was for the production of additional MkIII ‘dive bombers’, but this too saw cancellation.

A variety of Service Flying Training Schools — Nos 1, 6, 5 and 4 — plus No 2 OTU operated CA-8 A20-427 during its RAAF career. STATE LIBRARY OF VICTORIA



Development

Technical Details

In Service

Insights

A If Gard trained on the type and recalled, “We were service flying on Wirraways which most pilots will tell you, if you can fly a Wirraway you can fly any kite, and it’s true. It’s a difficult plane to fly. The Wirraway had one danger: it used to stall without warning in a steep turn, and we were all told about it. When you’re doing a steep turn, you go to pull tighter and tighter, but you get a shudder before it stalls, and then it goes ‘bang,’ into a spin. The Wirraway didn’t have any shudder. Lots of blokes were killed in Wirraways doing tail-chases [...] trying to outdo one another, and too close to the ground... you’d pull it tighter and tighter and ‘boof’ — and you were in a spin... no warning”. Norm Gampe added, “on landing

one had to be on the alert until the end of the landing roll else it could develop a ground loop.”

Fg Off G. L. Lansell of No 4 Squadron wrote of searching for Japanese soldiers in his diary

when operating in Papua New Guinea: “We knew there must be more about somewhere so made a very thorough search and eventually found fifteen under one of the buildings in Wandumi

village, so we strafed them. Some got into the grass and we thought there might be more about so had an Arty [artillery] shoot on the village, and as a final gesture we strafed again. The Arty shoot [went] well and I should hate to have been in any of those native huts.”

Scotty Taberner, an experienced warbird pilot with significant time on both Harvards and Wirraways, discusses the variations between them: “The Wirraway is much heavier and heavier-built. If you look at the wing, the rivet spacing is closer — twice the number — on the Wirraway than the Harvard, and the rivets a heavier gauge.

“The most notable thing flying the Wirraway is it’s a *lot* heavier and, having essentially the same engine, the power-to-weight ➤



At Point Cook, Flt Lt K. H. Godfrey, the instructor in the back cockpit, gives pre-flight instruction to Flt Sgt N. Hampton. STATE LIBRARY OF VICTORIA



LEFT: Wirraway A20-663 gets airborne in the lead of a formation take-off from Point Cook.

COLIN PECK VIA KEITH WEBB

ABOVE: The front cockpit of A20-704 following restoration to almost original condition. Kermit Weeks now owns this aeroplane. JAMES KIGHTLY

ratio is a lot worse. The VNE on a 'dive-bomber' -wing Wirraway III is 310kt, against about 280kt on the standard Wirraway and 190kt on the Harvard. So, with the Harvard you can be approaching the VNE in aerobatics, but not with the Wirraway — it can feel like you're going to break the stick! In a dive the canopy rattles and it's relevant that the Wirraway's canopy is a lighter construction than the Harvard's."

The slightly earlier, pre-war British-style adaptation of the Wirraway to the later Harvard is most notable in the cockpit. Taberner says, "the Wirraway's hydraulic system's not nearly as good as the Harvard's. The Harvard hydraulic selections time out, whereas on the Wirraway you have to deselect the hydraulic system power push to prevent the hydraulics from overheating. The tailwheel

only locks in a straight line, with a separate lever, unlike the better, limited travel in the Harvard or Mustang.

"The stall isn't unusual for a military trainer, and the Harvard's stall isn't nice either, but the Wirraway won't give you much warning, with very little buffet. Trainees in the war coming off the much more benign Tiger Moth would have found the Wirraway a handful. The different

wing sweep isn't notable in the handling otherwise.

"The warbird Wirraways I've flown have been lighter-equipped than they would've been in service. However, that heavier structural weight means that when I've flown aerobatics with Harvards, I've had to break off to fly a separate solo — the Wirraway can't do a formation loop with a Harvard."

A

DATAFILE ///

THE SURVIVORS' RENAISSANCE

The first Wirraway, A20-3, was reserved for the Australian War Memorial, but it was disposed of due to space constraints in the 1950s. Another famous specimen of the type, 'Zero killer' A20-103, was acquired during 1959.

Wirraways disappeared from the skies until Ron Lee and Graham Schutt completed the construction of VH-BFF between 1971 and 1975 from the remains of A20-570 and a collection of parts purchased from CAC. The aircraft made its first flight at Moorabbin, Victoria, on 4 December 1975. Other than those undertaking aerial work, this was the first privately operated, ex-military aeroplane to be allowed a civil registration in Australia. It paved the way for numerous other restored warbirds to return to the Australian skies. A 1988 change to the Civil Aviation Act allowed for ex-military aircraft to be granted a special certificate of airworthiness in the 'limited' category.

A healthy number of Wirraways survive at the time of writing, with three airworthy

examples regularly active on the Australian airshow circuit. Seven have flown on the Australian civil register as warbirds, namely A20-81/VH-WWY, A20-652/VH-WYR, A20-653/VH-BFF, A20-695/VH-MFW, A20-704/VH-BFO, A20-719/VH-WRX and A20-722/VH-CAC. The most that have been airworthy at any one time was six, and four have gathered together at Caboolture, Queensland, on two occasions. A20-719 was lost in a fatal accident at Nowra, New South Wales, during 1999. Fewer than a dozen Wirraways are known to be under restoration to airworthy condition.

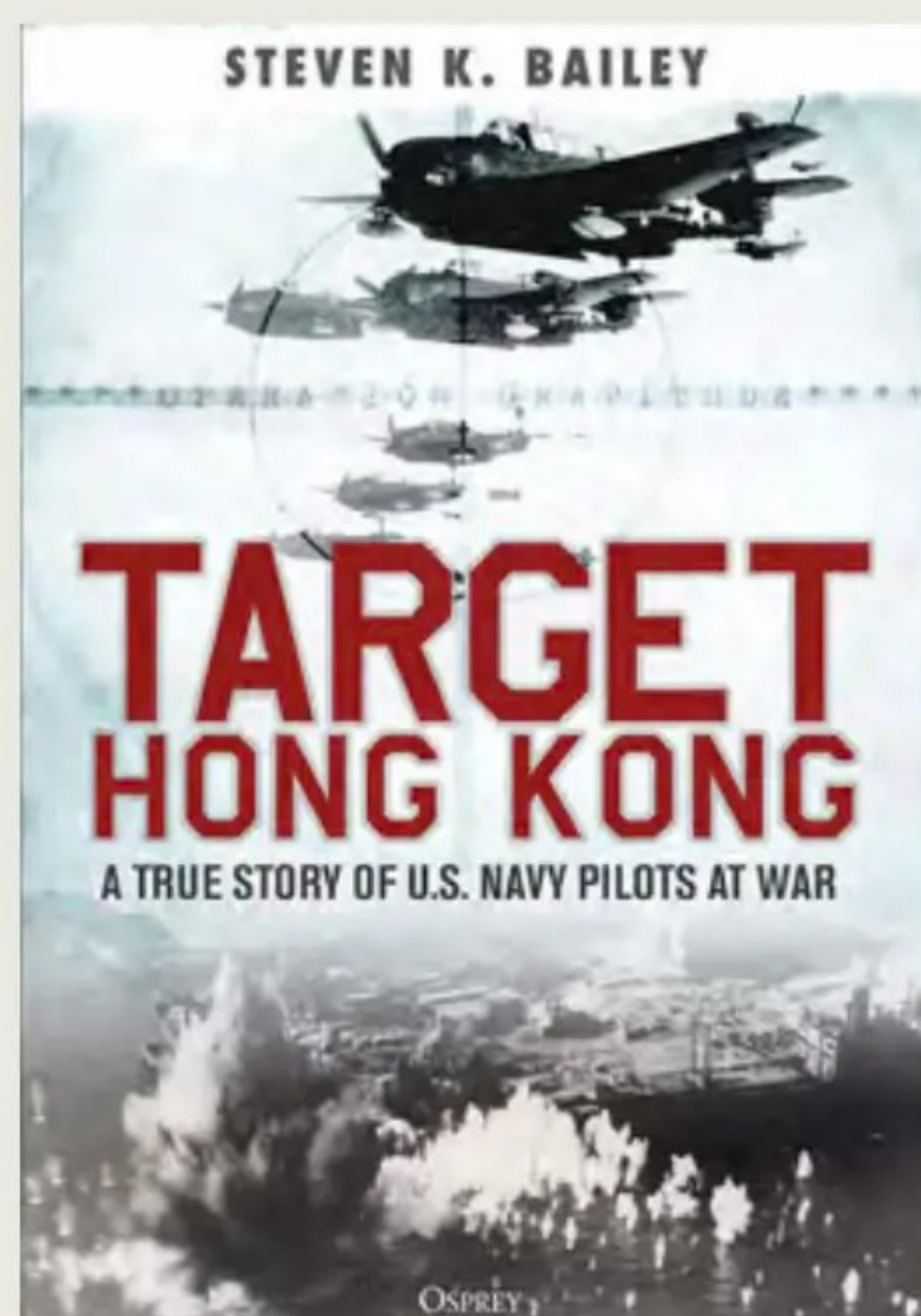
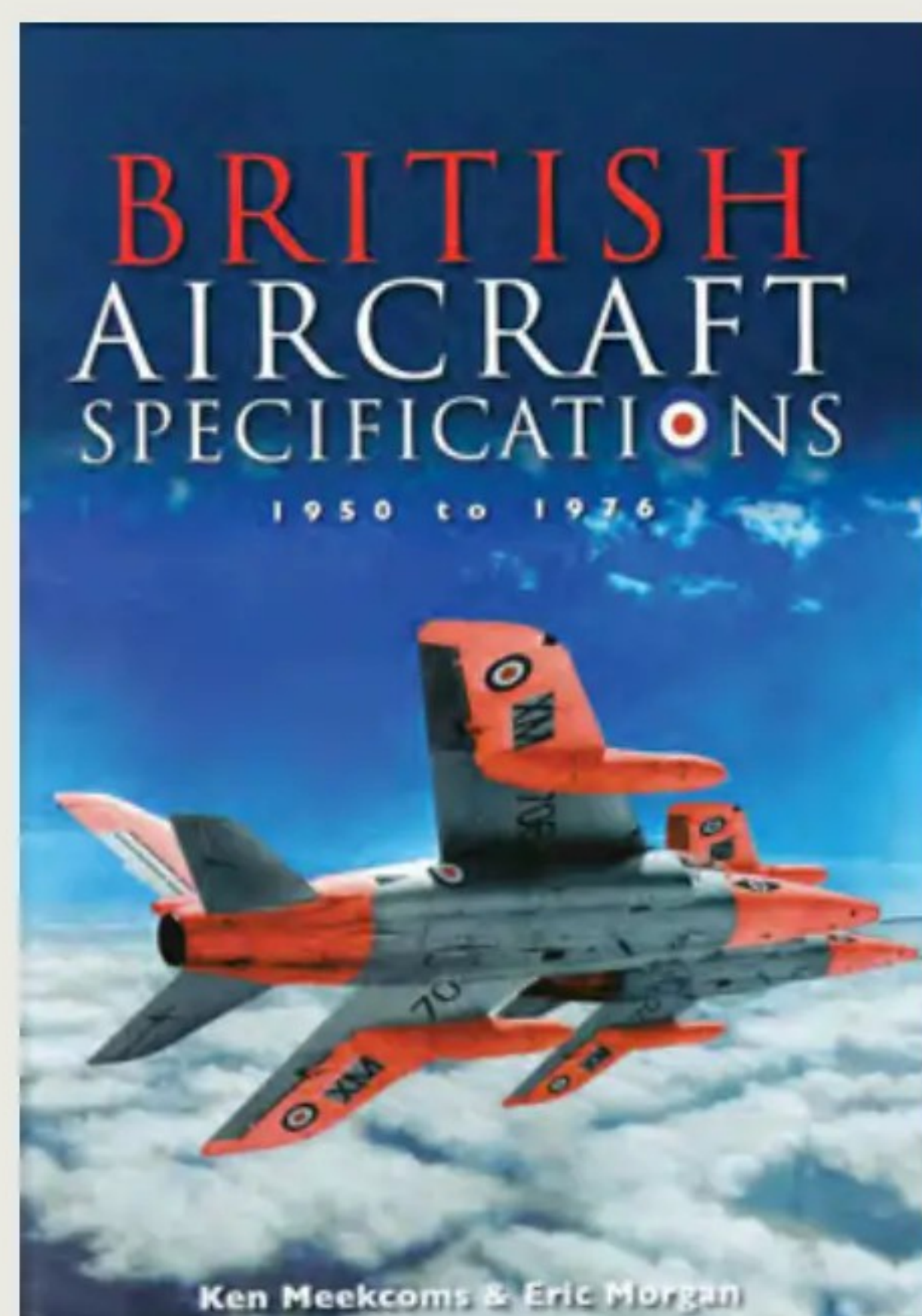
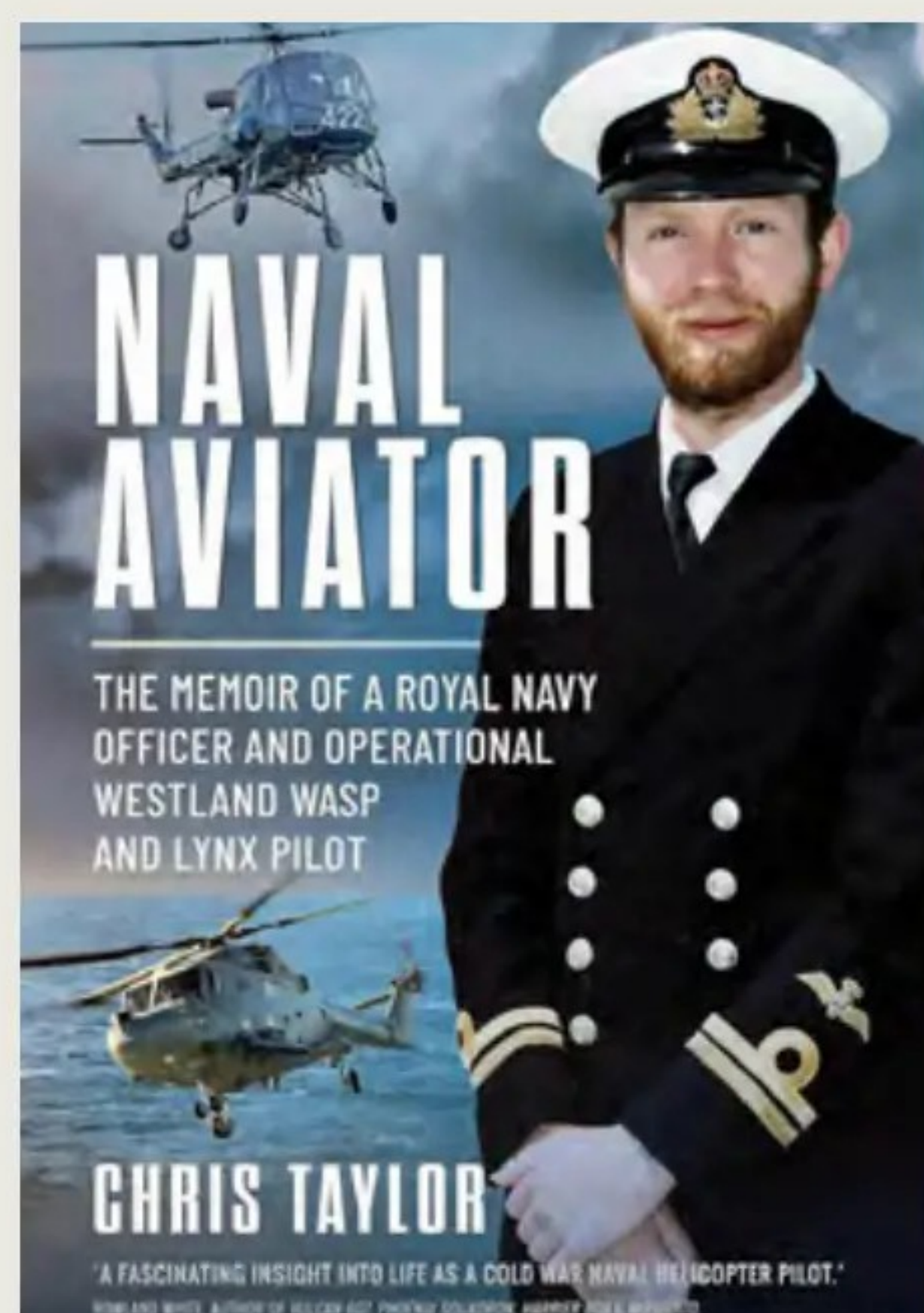
One Wirraway airframe was combined with a Royal Canadian Air Force Yale to replicate a Swedish Sk 14 (NA-16-4M) for display at the Flygvapenmuseum in Linköping. Nine additional Wirraways — A20-10, -13, -103, -511, -649, -651, -685, -687 and -688 — survived into preservation and are to be found in museum collections in Australia, Papua New Guinea and the USA, while five additional machines are presently reported as being under restoration to static display.



The RAAF's No 100 Squadron heritage flight now operates CA-16 A20-653/VH-BFF from Temora. RAAF



After restoration to its earliest configuration at the Moorabbin Air Museum, Ashley Briggs starts the oldest surviving Wirraway, A20-10, on 6 September 2014, exactly 75 years after its first flight. JAMES KIGHTLY



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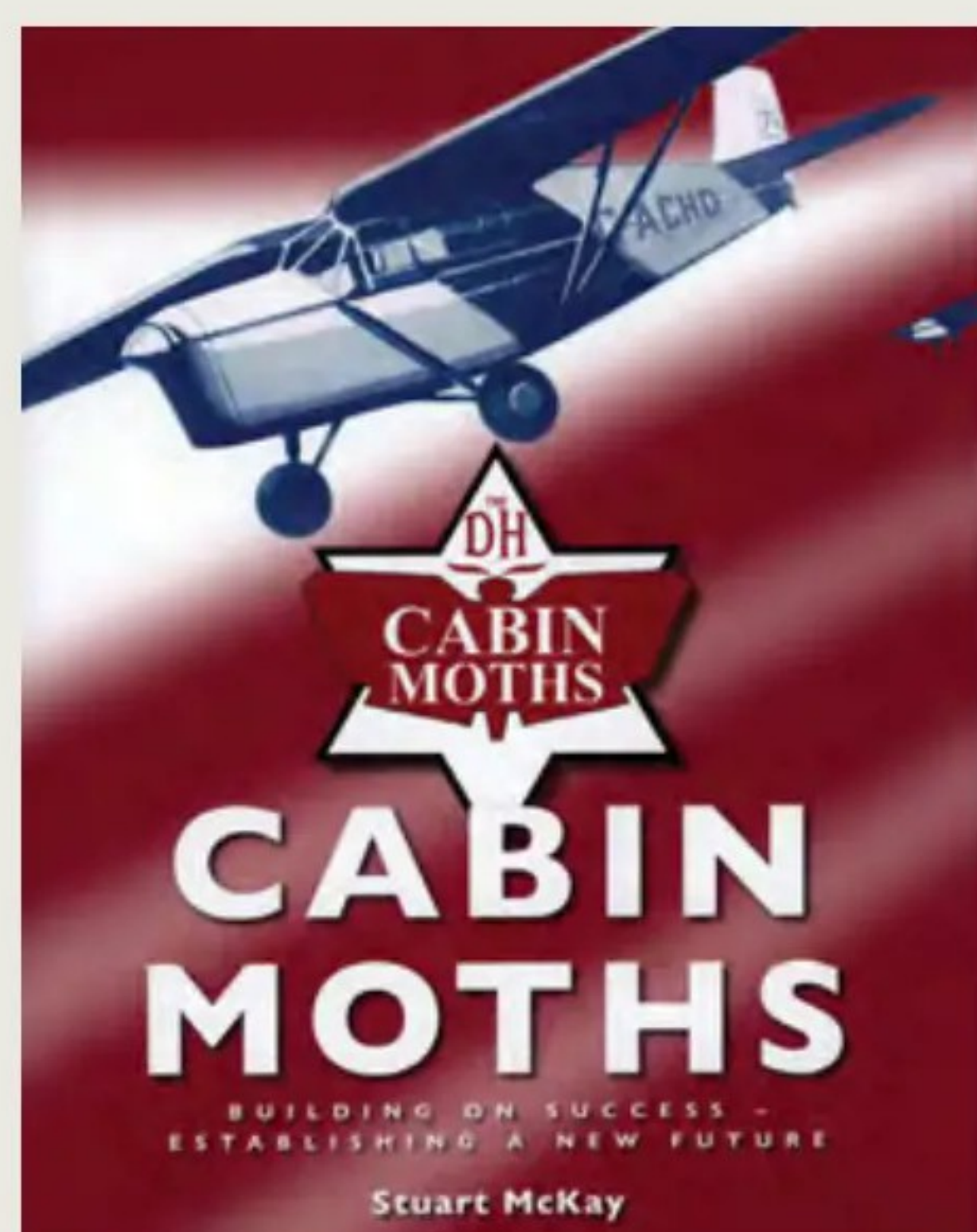
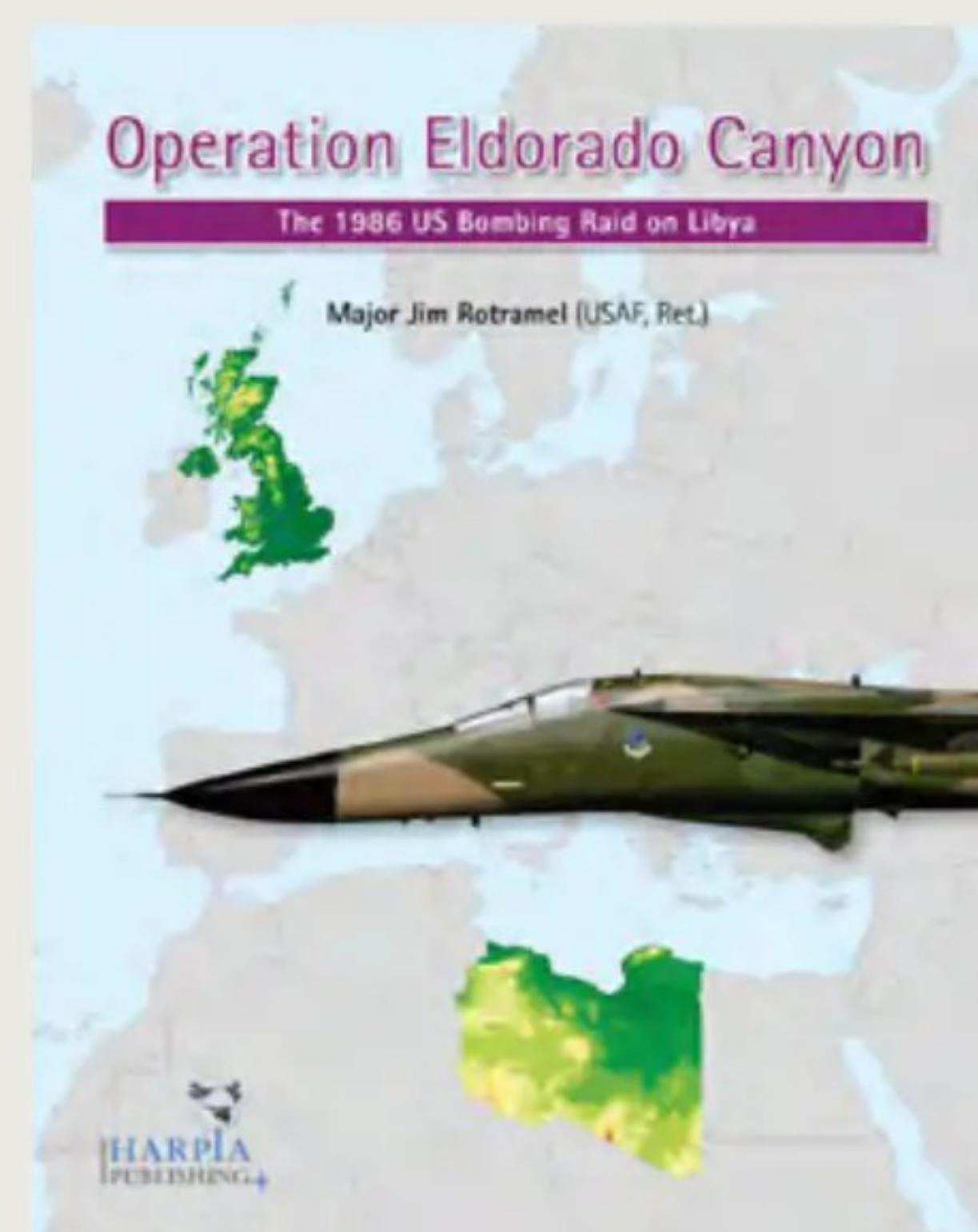
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Reviews

REVIEWS RATING

- ★★★★★ Outstanding
 ★★★★☆ Excellent
 ★★★☆☆ Good
 ★★☆☆☆ Flawed
 ★☆☆☆☆ Mediocre
 ☞ Enough said

The latest books for the discerning aviation enthusiast

Flying From Shangri-La

by Matt Dearden

published by Troubador Publishing

This is a bit different from our usual Book of the Month choices. While Pilatus's outstanding PC-6 Turbo Porter utility aircraft has been around a long time, and arguably counts as one of aviation's unsung legends, it isn't really historic — yet. And while the author is among the shareholder pilots of Plane Sailing's Catalina, that doesn't enter into this story. Rather, it's an account of Dearden's time in Papua New Guinea, flying the PC-6 for Susi Air, as featured a few years back in the Channel 4 series *Worst Place To Be A Pilot*.

The company was colourful enough. One newly arrived deputy director of operations rumoured to be "a wanted criminal on the run from Interpol" turned



BOOK of the MONTH

out to be, well, almost exactly that. And then there was the flying. Given the nature of the terrain and its airstrips, this was sufficiently risky without the added hazards of, for example, consuming some bacteria-ridden mayonnaise and coming down — while at the Porter's controls — with food poisoning so bad a crash almost ensued.

There are lots of genuinely gripping stories in here, all enjoyably and eloquently told, yet modestly too. It makes for a very good read. Quite apart from that, the fact of the author changing

his career and achieving his dream of flying for a living against the background of suffering a serious anxiety disorder, and being dyslexic, renders his tale a most inspiring one. **Ben Dunnell**

ISBN 978-1-80514-541-7; 9.5 x 6.4in hardback; 251 pages, illustrated; **£22.00**
 ★★★★★

Dogfight 12: Bf 109E Battle of Britain

by Andy Saunders

published by Osprey

Osprey's 'Dogfight' series, introduced in 2022, promises "to give a voice to some of the lesser-known pilots, as well as the famous aces, as they saw combat in the war-torn skies across the world, charting their exploits through

tactical ribbon diagrams, technical drawings and profiles, battlescene artwork, armament views and more". The recipe works well here in this, the 12th 'Dogfight' title, devoted to the Messerschmitt Bf 109 E, the Luftwaffe's most important single-seat fighter of the early part of the war.

The text starts with the fall of France on 22 June 1940, when Luftwaffe units started



preparations for the onslaught on the UK which would become the Battle of Britain. The author examines the Bf 109 E and its employment from many angles, revealing both its strengths (at least partly deriving from the benefit of combat experience gained with the Legion Condor in the Spanish Civil War) and its weaknesses (the Hurricane could out-turn the 109 and had better low-altitude manoeuvrability). Monochrome photo reproduction rates as 'good'. An attractive, detailed and intelligent read.

Denis J. Calvert

ISBN 978-1-4728-6240-2; 9.8 x 7.3in softback; 80 pages, illustrated; **£15.99**
 ★★★★★

Vought F7U-3 Cutlass

by Tommy H. Thomason and Alfred C. Casby

published by Hikoki Publications/Crécy

The latest in the publisher's 'Famous American Aircraft' series tackles one of the most dramatic-looking aeroplanes in military

aviation history.

Sadly, the advanced appearance and technology of Vought's F7U-3 Cutlass — which, as a tail-less design with afterburner-equipped engines, was in advance of any other production fighter at the time — was not to herald service success. The low-speed handling characteristics left much to be desired, hardly a favourable attribute for a carrier-borne type, and perhaps a high accident rate should come as no surprise. But is the F7U's poor reputation deserved, or indeed held for the right reasons?

Here, historian Thomason is joined by pilot Casby — the man masterminding the restoration to flight in Mesa, Arizona of the world's only potentially airworthy Cutlass — to tell the whole story, and set the record straight. They have done a splendid job, exploring every aspect of its history and offering useful reassessments of its record. The volume is produced to a high standard, with many well-reproduced photos, including period colour. Given that level of quality, the fact of the Comic Sans font being used on diagrams and specially annotated photos looks surprisingly cheap and out-of-place, while the typeface on the squadron allocations table is so tiny as to almost require a magnifying glass. These points, though, can largely be overlooked, given how this is *the* outstanding book on the Cutlass. **BD**

ISBN 978-1-80035-294-0; 11.25 x 9in hardback; 384 pages, illustrated; **£39.95**
 ★★★★★

Convair B-36 Peacemaker

by Graham M. Simons

published by Air World Books

Conceived during World War Two, when the possibility of Great Britain falling to German invasion had to be taken into account, Convair's B-36 was designed with a 10,000-mile range that would have made possible unrefuelled bombing of Germany from bases in the continental US. Almost everything about the B-36 was impressive — its 230ft wingspan, its 87,000lb bomb load and its



15-man crew — although its cruising speed, even when boosted by two pairs of J47 turbojets, was embarrassingly low and led to the type's early retirement after only a short time in the USAF's front line.

Here, the B-36, its evolution and its service with SAC are given thorough treatment. Also related in the chapter 'Conflict with Northrop' is the story of the competing B-35 and B-49 'flying wing' designs, contemporaries of the B-36 which proved to have disadvantages as bomber aircraft compared with the 'conventional' B-36. The photo selection, which includes some colour, is excellent and shows good reproduction. While the shot of three B-36s overflying the Capitol Building in Washington DC may be well-known, that of 15 — yes, 15 — B-36s in loose formation at low level is not, and records what must have been an experience to remember for anyone who witnessed it. **DJC**

ISBN 978-1-526787-31-6; 9.9 x 7.0in hardback; 299 pages, illustrated; **£32.00** ★★★★★

Airframe & Miniature No 6: The North American P-51 Early Mustang

by **Richard A. Franks**
published by Valiant Wings

Given the time-honoured 'Airframe & Miniature' treatment here in an extensively revised and updated second edition are the early Allison-engined prototypes, production variants and trials aircraft, continuing to the Merlin-powered P-51B and P-51C. In fact, the Rolls-Royce-designed (but Packard-built) engine was not the only British twist to the Mustang; a popular change to many aircraft was the fitting of a frameless 'slightly bubble' Malcolm hood, which gave better all-round vision for the pilot. It was designed and built by R. Malcolm and Co of White Waltham and Slough, a company which later became ML Aviation. Remember, you heard it here first.

This volume impresses with its photo reproduction, mostly in black-and-white but with a few very decent wartime colour shots, a thorough relating of the evolution of the 'real' aircraft, 36 pages of isometric views, a detailed chapter on 'Camouflage & Markings'



and much which will delight the plastic kit-builder. The colour profiles are well-executed, and cover not only USAAF but also RAF, Armée de l'Air, Swedish, Swiss, Russian and Dominican aircraft, not to mention a captured Luftwaffe example. **DJC**

ISBN 978-1-912932-41-2; 11.7 x 8.2in softback; 272 pages, illustrated; **£28.95** ★★★★★

Sky Stories 4

by **Dave Unwin**
published by Pigs Might Fly Publishing

The now annual appearance of Unwin's latest *Sky Stories* collection is much to be enjoyed, for there's always something nice about the sort of uncomplicated, well-written book you can glance through casually, yet still learn something from. The format is much the same as usual: a selection of the author's flight-tests of machines many and varied, interspersed by reflective little pieces on such topics as people, places and lessons learned. It won't win any prizes for design, and the few images are definitely of secondary importance, but it's at once good fun and full of insights.

Not all the types included are of an historic bent, but a good many are. The descriptions of piloting, for example, a B-25 Mitchell, Miles Magister, Antonov An-2 and Bücker Bestmann are suitably enjoyable. But the cover subject, the trusty Piper Pawnee, provides probably the highlight. **BD**

ISBN 979-8-3432-2964-6; 9 x 6in softback; 215 pages, illustrated; **£9.99** ★★★★★

Pulp Fiction Fighters

by **Dan Hagedorn and Carlos A. Garcia**
published by European Airlines

What a bewildering range of aircraft was exported to Latin America's air arms during the 1930s. The reasons why are explained in the blurb of this new offering from European Airlines: many local conflicts, companies with aeroplanes to sell, and thus a potentially lucrative market. In the event, many of the deals were small affairs, this despite plenty of publicity. Some of it, as Hagedorn puts it in his introduction, was "a strange mix of fact and fiction", involving lurid colour artworks — hence the title of this volume.

Perhaps unfortunately, only one actual example of such a publication is included,



and that in black-and-white. But, after a country-by-country run-down and a type-by-type index, the body of the book is made up of Garcia's excellent colour side-view artworks, two to a page, appearing in alphabetical order of manufacturer. These have been completed using the best available information, which in some cases isn't much at all. It makes for a fascinating array.

The sales of Curtiss-Wright and Vought machines in quantity are reasonably well-known, and in the case of the former the book claims to correct some previously published details. But then there are the likes of a single Wilson Model 3-B Midwing supplied to Honduras, described as "the most elusive type of this entire study", which ensure there's a great deal you are highly unlikely to have seen depicted before. All very interesting indeed. **BD**

ISBN 978-82-93450-31-3; 12 x 8.5in hardback; 216 pages, illustrated; **NOK449.00** from www.europeanairlines.no ★★★★★

PACAF and Alaskan Air Command in the 1980s

by **Adrian Symonds**
published by Amberley



This volume sets out to detail the units, equipment, organisation and bases of the US Air Force's Pacific Air Forces and Alaskan Air Command through the 1980s, an ambitious task in 96 pages. The result is undeniably

comprehensive, but the text is, of necessity, jam-packed with facts and figures and compressed. As a result, the claim on the back cover that invites the reader to "Take a step inside the day-to-day operations of PACAF and AAC in the 1980s" is only occasionally achieved; there is simply too little page space available for comment, background, explanation or the recounting of events. The final 10 pages are given over to a bibliography and appendices listing the structure and units of these two major commands as at 1980 and 1989. **DJC**

ISBN 978-1-3981-1584-2; 9.2 x 6.5in softback; 96 pages, illustrated; **£15.99** ★★★★★

CHRISTMAS GIFTS

Finest Hour Experiences

Recently relocated from Oxfordshire to Norfolk, Finest Hour offers unforgettable flying experiences in a fleet of immaculately restored vintage and classic aeroplanes. Take the controls yourself as you float over the Norfolk Broads, the stunning Norfolk and Suffolk coastlines or historic castles, country houses and forts in the quintessential English biplane, the open-cockpit Tiger Moth. It's possible for two people to fly alongside each other in the Tiger Moth formation experience.

Finest Hour's pilots have a very broad array of backgrounds, including airline, military and display flying, so aerobatic manoeuvres can be included towards the end of the biplane flights, if you so desire. There are also dedicated aerobatic experiences in the specialist CAP 10. All flights are sold as professionally produced and gift-wrapped vouchers to be redeemed during the 12 months following purchase.

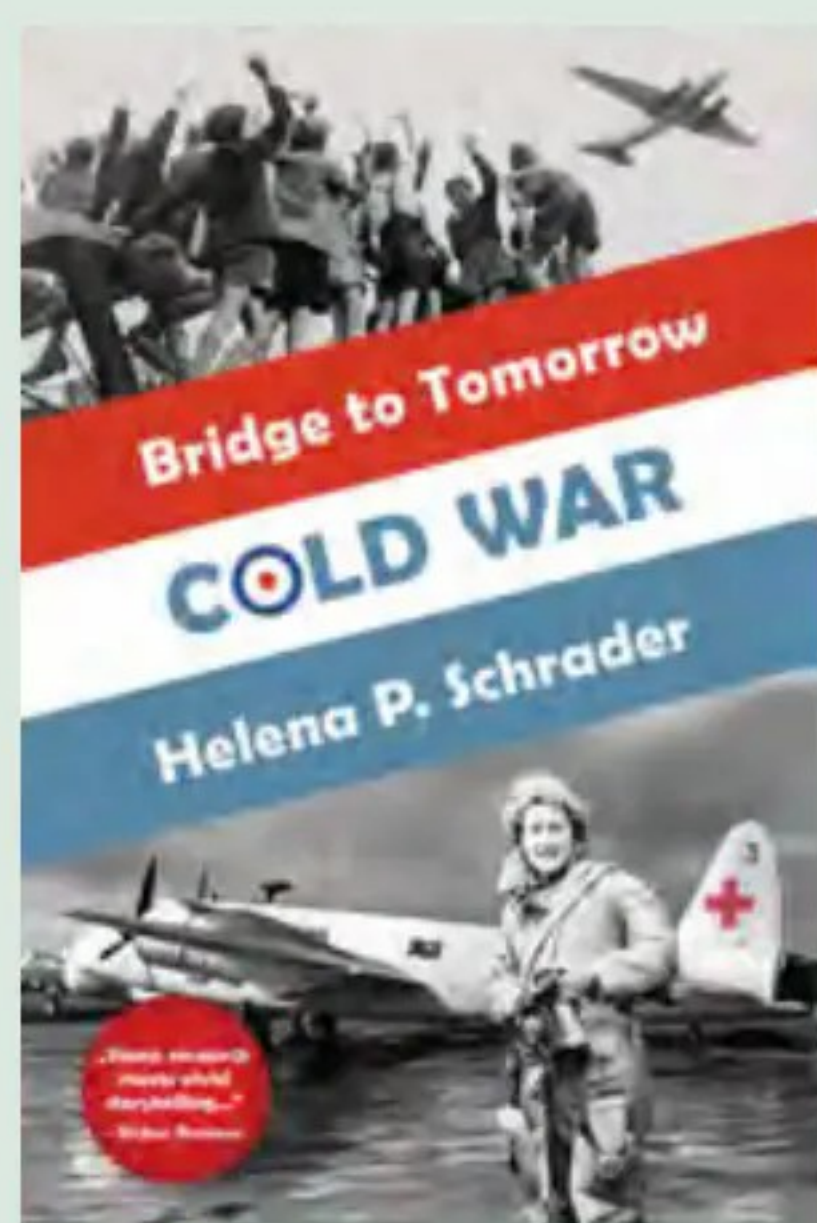
Information and ordering: www.finesthourexperiences.co.uk



Cross Seas Press novels

Cold Peace and *Cold War* are the first two novels in Helena P. Schrader's acclaimed 'Bridge to Tomorrow' series. It brings to life the Berlin crisis of 1948-49, with Schrader highlighting the critical and frequently overlooked British contribution to Western victory, a theme she also addressed in her well-received non-fiction work *The Blockade Breakers* (The History Press, 2008). Rather than focusing exclusively on the political chess game and logistical achievements, the novels explore the social and psychological impact of this pivotal historical event. And it is notable how the works remind us about the dangers of tyrannical regimes.

Information and ordering: www.crossseaspress.com



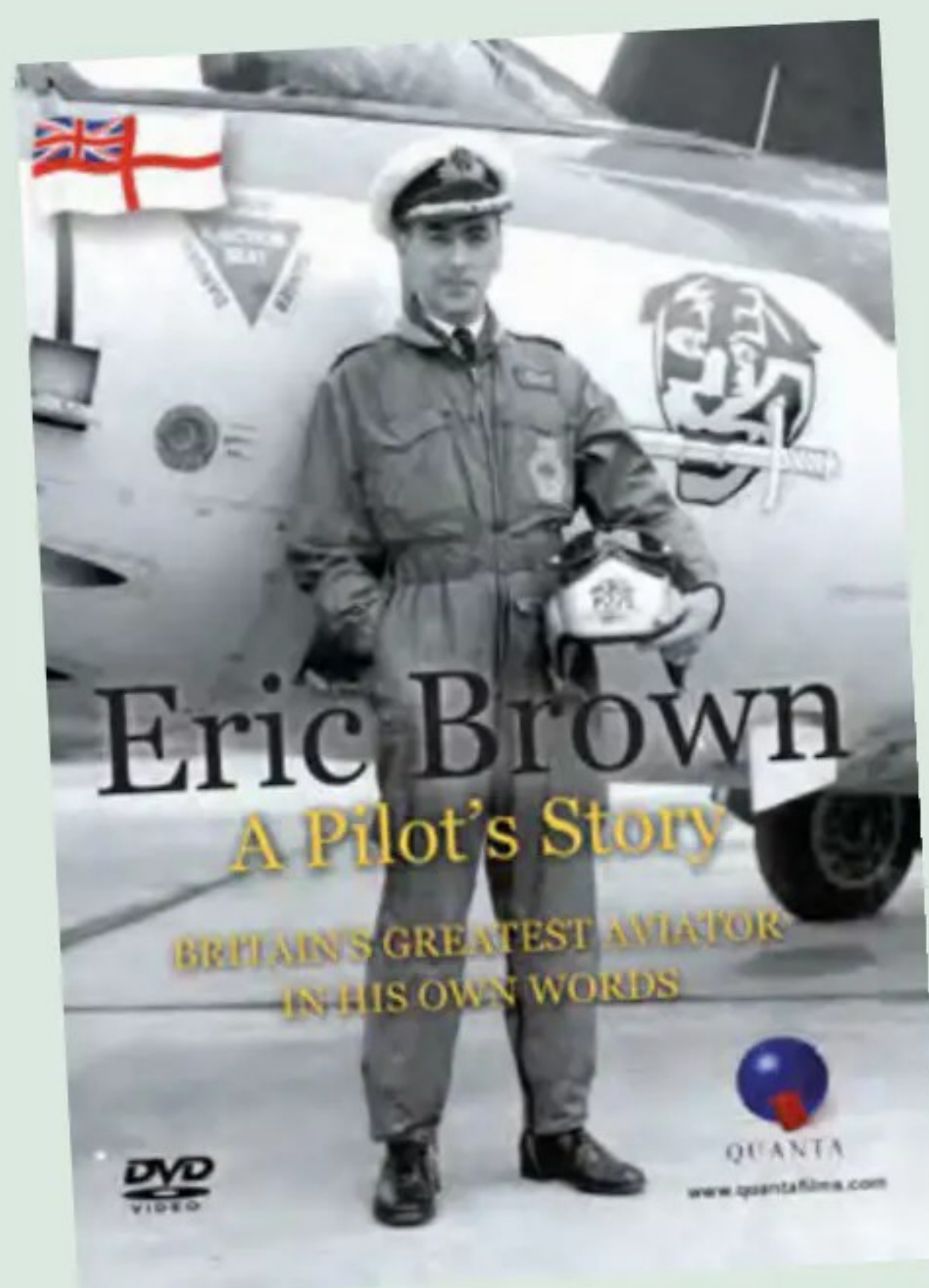
European Airlines books

The small Norwegian publishing house European Airlines specialises in titles on civilian subjects, but covers a good many military ones too. Since 2007 it has released in excess of 45 books, and received prizes in both Norway and Sweden, as well as being the subject of several Book of the Month accolades here in *Aeroplane*. The ethos is to feature lesser-known aircraft and carriers. Future releases will take in such subjects as the Fokker FXX, the Farman Jabiru family, the tri-motor Fokker F.IX, F.XII and F.XVIII, the Fokker F.VII, the Fokker F.I, F.II and F.III, Fokker F.24, the Armstrong Whitworth Ensign, the de Havilland DH86 Express, and the second and last volume in the series *The Beginnings of Norway's Airlines*,



covering the years 1923-45. The latter will include an analysis of the Norwegian civil aircraft register up to 1945. Subscribe to the European Airlines newsletter for the latest details, and look out for our reviews.

Information and ordering: www.europeanairlines.no



Quanta Films DVDs

Whittle — The Jet Pioneer and *Eric Brown — A Pilot's Story* are two feature-length TV documentaries by Nicholas Jones with some very special material at their core. In the first title is a unique interview filmed with Sir Frank Whittle, to capture his story for posterity. For the second one, a day was spent with Capt Eric Brown recording his own life on camera. This pair of films reveal how Sir Frank was such a pre-eminent aeronautical engineer, and Brown a leading test pilot. They are available on DVD with bonus features. Both documentaries use fascinating film archive to support the testimony of the two great men, while *Whittle — The Jet Pioneer* also boasts interviews with Dr Hans von Ohain and Ian Whittle, Sir Frank's son. See samples on the Quanta Films website. The DVDs will be posted on the day of order.

Information and ordering: www.quantafilms.co.uk or call 07435 973397



RAF Association

Every year, the RAF Association provides life-changing support to thousands of serving personnel, veterans and their families, helping them lead dignified, fulfilled and independent lives. This Christmas, you can make a difference to the lives of people in the RAF community by buying your Christmas cards and aviation gifts from the association's shop. All profits go towards helping these people, who may be lonely and isolated or struggling with physical and mental well-being issues, making these Christmas purchases extra-meaningful. Products

available include RAF watches, clothing, accessories, homewares, models and toys, to name but a few.

Information and ordering:
www.rafatrad.co.uk

Randolph Engineering Military Specification Aviator Sunglasses

The Mil Spec Aviator sunglasses produced by Randolph have been standard issue for US military pilots since 1982, and come in an extremely wide variety of sizes, colours ➤

Focke-Wulf watches

Focke-Wulf offers a range of watch models inspired by civil and military aeroplanes made by the eponymous aircraft manufacturer. The Condor takes its cue from the four-engine Fw 200 airliner. Looking appropriately 1930s-esque the watch has, according to the maker, a 38mm "chrome-look high-grade stainless steel plated case" with a black dial.

Next up in order of price, the Flitzer Flieger III (pictured at far right) has a 42mm stainless steel case with tapering brushed lugs and a chrome bezel. It is water-resistant to 100m/10 atmospheres and features a tachymeter and date indicator. Clearly taking part of its inspiration from the famous World War Two B-Uhren military watch, the Würger II has a 42.5mm stainless steel case with tapering brushed lugs and a chrome bezel. It is distinguished from the similar Würger I by virtue of its sepia-toned, beige dial.

The top-of-the-range Marinejäger Fw 200 dive watch (shown at right) boasts a Sellita automatic mechanical movement that can be seen and shown off through the 'exhibition' back, a 42mm stainless steel case, tapering polished lugs and a chrome bezel.

Prices: Condor **£129**, Flitzer Flieger III **£289**, Würger I **£289**, Würger II **£299**, Marinejäger Fw 200 **£899**

Information and ordering: fockewulf-watches.com



CHRISTMAS GIFTS



and lenses. The latest iteration of the famed Mil Spec 25948 Aviators is now out, and features a satin gunmetal frame and slate polarised gradient nylon lenses. The bayonet-type temples fit comfortably under headsets, leather flying helmets and bonedomes, and have found wide appeal among all types of pilots and non-pilots alike. They are available in 52mm, 55mm and 58mm sizes, with temple and lens options, and frame colours too numerous to mention.

Information and ordering:
www.randolphusa.com

Vulcan Restoration Trust

Based in Hangar 5 at London Southend Airport, the Vulcan Restoration Trust continues to preserve Vulcan B2 XL426 as a live, taxiing example of Avro's delta-winged bomber. Proceeds from souvenir and memorabilia sales all go towards keeping XL426 in tip-top condition. The latest additions to the trust's clothing range are the Vulcan Shatter T-shirt and sweatshirt; the Shatter designs were popular with enthusiasts back in the 1990s and early 2000s, and have now been revived. Both T-shirts and sweatshirts come in a variety of sizes, with the T-shirt available in black or blue, and the sweatshirt in black.

For memorabilia aficionados, meanwhile, there's the newly issued Vulcan Display Flight Collectors' Coin. As we featured in the May

REC Watches Habu watch

The new Habu timepiece from REC Watches pays tribute to the legendary Lockheed SR-71, best-known as the 'Blackbird' but referred to by its crews as the 'Habu', after a type of snake found near Kadena on the Japanese island of Okinawa which was one of the type's operating bases. Each watch — measuring 40mm in diameter and only 12.3mm in height — is created from reclaimed materials sourced from the only remaining SR-71B two-seat trainer model. The case is crafted from a single piece of grade 2 titanium, inside which is a Swiss-made mechanical movement with a 45-hour power reserve. The lower dial is fashioned from the inner engine nacelle exhaust ejectors, the 'turkey feathers', while the top dial draws inspiration from the SR-71's exhaust flaps. The design overall echoes a cockpit gauge, with the power reserve indicator at six o'clock mimicking the unique triethylborane (TEB) throttle management system, essential for engine ignition at high speeds and altitudes. Pre-order now to take advantage of a discount.

Price: **£1,395** with pre-order discount
Information and ordering:
recwatches.com



Aeroplane, 2024 was the 40th anniversary of the flight's formation at RAF Waddington, with XL426 being its first aircraft. The coin marks the anniversary and is the latest in a series that will feature every RAF unit with which the aircraft served. Only 50 coins have been produced, all taxied on board XL426. Each comes complete with a full-colour illustrated insert and in a presentation box.

Information and ordering:
shop.avrovulcan.com



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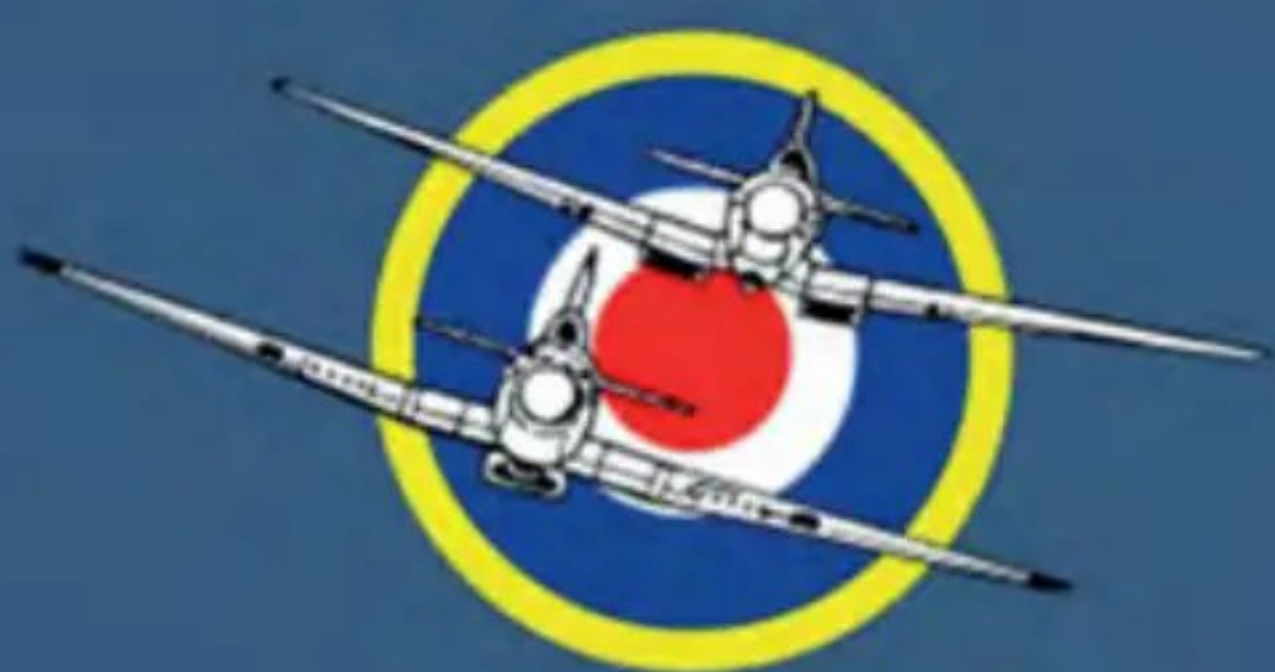
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